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HORSFALL (J. G.). **Biological assay of protective fungicides.**—*Chron. bot.*, vi, 13, pp. 292–294, 1 fig., 1941.

The information in this paper, which briefly reviews studies carried out at Connecticut Agricultural Experiment Station on the laboratory testing of the protective value of fungicides, has already been noticed from other sources [*R.A.M.*, xviii, p. 538; xix, p. 665].

KLEMM (M.). **Pflanzenschutz in der UdSSR.** [Plant protection in the U.S.S.R.]—*Angew. Bot.*, xxiii, 2, pp. 41–62, 2 maps, 1941.

The writer traces the history of the plant protection service in Russia, the first section of the paper being devoted to the period from the mid-nineteenth century to 1914, the second covering the years 1918 to 1930, and the third dealing with recent developments.

The unprecedented increase of plant pests after the war of 1914 to 1918 necessitated energetic control measures, and a network of organizations was formed to meet the specific needs of the farming communities in different parts of the country, while at the same time academic studies were actively developed. In 1930 the Pan-Russian Association for Pest Control was founded, and its present activities include an observation and warning service, a quarantine commission, research institutes for agricultural aviation and chemical plant protectives, and laboratories for virus and bacterial diseases and for pathological physiology. The headquarters of the scattered regional research stations is situated at the Pan-Russian Lenin Academy of Agricultural Science, Leningrad, to which 110 scientists were attached according to the 1935 report. The estimated total losses from plant diseases and pests of the principal agricultural crops in 1933 amounted to nearly 812,000,000 roubles, among the figures cited being 406,122,200 roubles for potato blight (*Phytophthora*) [*infestans*], 238,823,400 roubles for the combined loss from apple scab [*Venturia inaequalis*], *Monilia* rots [*Sclerotinia fructigena* and *S. laxa*], and insect damage, and 26,362,000 roubles for vine downy mildew [*Plasmopara viticola*].

PANASSENKO (W. T.) & TATARENKO (J. S.). **Psychrotolerante Pilzflora bei Nahrungsmitteln.** [The psychro-tolerant fungal flora of foodstuffs.]—*Микробиол.* [*Microbiol.*], ix, pp. 579–584, 1940. [Russian. Abs. in *Chem. Zbl.*, cxii (i), 19, pp. 2538–2539, 1941.]

At the Ukrainian Institute for Food Industry, Kharkoff, most of the

moulds isolated from meat, fruit, and other foodstuffs in cold storage [*R.A.M.*, xviii, p. 467] belonged to the genus *Penicillium*, probably originating on the walls, packing material, and the like, in adjoining rooms with a fairly high temperature. Experiments with individual species showed them to be markedly tolerant of cold, the minimum temperature for growth in some cases, e.g., *P. puberulum* and *P. chrysogenum*, lying below—4° C. The minimum temperature for the development of most of the *Aspergillus* species tested was found to range from 6° to 12°, only one or two, such as *A. amylovorus* Panassenko, being capable of growth at 2° to 3°. Good control of the moulds was obtained by the disinfection of the walls (in the absence of whitewash) with 0·5 per cent. acetic acid.

NISIKADO (Y.). **On the heterothallism of phytopathogenic fungi.**—*Ber. Ōhara Inst.*, viii, 4, pp. 477–488, 1941.

Many of the outstanding contributions to the literature on heterothallism in phytopathogenic fungi included in the eight-page bibliography appended to the author's concise review of the subject have been noticed in this *Review* from the original sources. Attention is briefly drawn in the conclusion to the likelihood of an increase of pathogenicity in the new strains or hybrids arising from heterothallic unions, which may present grave problems to plant-breeders engaged in attempts at the development of disease-resistant varieties.

ANDRUS (C. F.). **Preparation of inoculum with a mechanical liquefier.**—*Phytopathology*, xxxi, 6, pp. 566–567, 1941.

With the aid of an instrument variously designated a blender, high-speed mixer, homogenizer, or liquefier, the need for conidia or other spore forms for mass inoculations is eliminated, and excellent results have been obtained by its use at the South-Eastern Regional Vegetable Breeding Laboratory, Charleston, South Carolina, in the infection of tomatoes with mycelial fragments of the early blight (*Macrosporium* [*Alternaria*] *solani*) and grey leaf spot (*Stemphylium solani*) organisms. The slicing and beating of the blender are accompanied by a strong centrifugal action, and in five minutes or less coarse fungal mats are reduced to particles minute enough to traverse a fine spray nozzle. The foliage of the plants may either be dipped in the liquid inoculum or sprayed with it.

YOUDEN (W. J.). **Fluctuations of atmospheric sulphur dioxide.**—*Contr. Boyce Thompson Inst.*, xi, 6, pp. 473–484, 3 graphs, 1941.

In the course of studies at the Boyce Thompson Institute, situated 15 miles north of New York City, on sulphur dioxide injury to plants, continuous records showed that the concentration of the gas in the atmosphere [*R.A.M.*, xix, p. 34] follows a daily cycle that changes with the seasons. In winter the concentration builds up during the day and falls off in the evening, and in other seasons it drops in the early afternoon, probably as the result of northerly breezes. There is also a weekly cycle which is the same at all seasons, in which the concentration is low on Sunday and Monday, increasing by about 50 per cent. to a maximum on Thursday and Friday, possibly owing to the greater industrial activity during the week, although this is thought doubtful. The

annual cycle follows a sine-shaped curve with a minimum of 15 parts of sulphur dioxide per 1,000,000,000 of air in the summer to a maximum of 50 in the winter. A strong correlation was found to exist between the sulphur dioxide concentration and wind direction and velocity, temperature, and to some extent rainfall.

THOMAS (W. D.). **The mycorhizal fungi and mycorhizae of four coniferous plantations in the Rhine Valley.**—*Phytopathology*, xxxi, 6, pp. 567–569, 1941.

Four 1-ha. plots of young pine (*Pinus sylvestris* and *P. strobus*), spruce (*Picea abies*), and larch (*Larix europaea*) near Karlsruhe in the Black Forest were examined for the presence of Hymenomycetes and mycorrhiza, two being located on sandy soil and two having a rich covering of humus. The sandy plots were entirely destitute of mycorrhiza, which were scanty, moreover, in one of the others formerly planted with oaks, but occurred in profusion in the remaining humus plot. The organisms associated with *Pinus sylvestris* [*R.A.M.*, xix, p. 488] were *Amanita muscaria*, *Boletus badius*, *B. granulatus*, *B. luteus*, *B. variegatus*, *Lactarius deliciosus*, and *Russula fragilis*; with *P. strobus*, *A. muscaria*, *B. porosus*, *B. bovinus*, *B. castaneae*, *B. granulatus*, *B. luteus*, *Cantharellus ciborius*, *L. chrysorrheus*, and *L. deliciosus*; with *Picea abies*, *A. muscaria*, *B. luteus*, *Cortinarius balteatus*, and *L. deliciosus*; and with *Larix europaea*, *A. muscaria*, *B. granulatus*, *B. luteus*, *B. variegatus*, and *C. camphoratus*. The trees with abundant mycorrhizal associations were the only ones of a healthy aspect and promising high yields.

BARROWS (F. L.). **Propagation of Epigaea repens L. II. The endophytic fungus.**—*Contr. Boyce Thompson Inst.*, xi, 6, pp. 431–440, 2 figs., 1941.

A mycorrhizal endophytic fungus was isolated in 1935 in Connecticut from rooted cuttings, collected plants, and seedlings of *Epigaea repens* [*R.A.M.*, iii, p. 224]. It was present in the stems and roots, on the flowers, pollen, and young ovules, on and in the mature fruit, and on the surface of freshly-ripened seeds. It is believed that the fungus becomes established in young seedlings from the hyphae present on the seed coat. The fungus occurs normally in the soil and *E. repens* cuttings were found to grow better in its presence.

The fungus grew rapidly on potato dextrose agar or in a 2 per cent. maltose solution, developing a cottony, white to pink aerial mycelium on the former and a submerged and gelatinous mycelium in the latter medium. Young, vigorous cultures were usually lighter in colour than older ones, very old cultures occasionally showing a purplish-red or red-brown colour. The pigment was found to be in the hyphal walls, being either distributed uniformly throughout the wall or deposited as granules. The hyphae were thin-walled and slender, with cross walls in the older ones; the aerial mycelium formed numerous conidia; chlamydospores, both terminal and intercalary, were frequent in submerged mycelia on maltose or in the older and somewhat desiccated cultures on potato dextrose agar and closely resembled those found in and on the roots containing mycorrhiza. The endophyte survived months of drying. Further investigations are necessary for the identification of the fungus.

Blumer (S.) & Schopfer (W. H.). **Beiträge zur Biologie und Wirkstoffphysiologie von Ustilago scabiosae (Sowerby) Winter.** [Contribution towards the biology and vitamin physiology of *Ustilago scabiosae* (Sowerby) Winter.]—*Ber. schweiz. bot. Ges.*, l, pp. 248–272, 1 fig.,3 graphs, 1940.

In the course of further studies on the effect of aneurin on the growth of *Ustilago scabiosae* [*R.A.M.*, xvii, p. 618], the authors obtained as good growth of recent Swiss isolations of the smut from *Knautia arvensis* and *K. silvatica* with the optimum concentration of aneurin (0·02 γ per 25 c.c. of culture solution) as with an equivalent mixture of pyrimidin and thiazol but at a higher concentration (0·05 γ per 25 c.c.). The results of an investigation of the ability of *U. scabiosae* to utilize different sources of carbon and nitrogen are tabulated, as is the effect of the glucose-asparagin concentration on copulation.

Bauch (R.). **Experimentelle Mutationslösung bei Hefe und anderen Pilzen durch Behandlung mit Campher, Acenaphthen und Colchicin.** [The experimental release of mutations in yeast and other fungi by treatment with camphor, acenaphthene, and colchicin.]—*Naturwissenschaften*, xxix, 32–33, pp. 503–504, 2 figs., 1941.

The writer's experiments with brewery yeasts and other fungi at the Rostock (Germany) Botanical Institute have shown that camphor, acenaphthene, and (to a lesser extent) colchicin are capable of inducing in these organisms chromosomal aberrations comparable to those developing in flowering plants treated with analogous substances. For instance, camphor (natural or synthetic) fumes at a certain concentration bring about in yeasts the production of long, filiform, pluricellular mycelia, which either disintegrate through collapse of plasma or proceed to the formation of abnormally large cells by budding. Some of the aberrant strains thus derived, presumably tetraploid or multivalent chromosomal forms, were characterized by important differences in size as compared with the original clone. In some cases they grow quite as abundantly as the parent and show equal or greater fermentative activity.

Pal (B. P.). **A note on an important virus disease of Potatoes in India.**—ex *Abs. Pap. Tenth ann. Sess. nat. Acad. Sci., India*, 1 p., 1941.

The author states that the important 'mosaic' disease of the Phulwa (= Patna White) potato variety in India has been identified by R. N. Salaman as due to potato virus Y. Observations at New Delhi showed that incidence was greater in earlier than in later plantings, and was effectively reduced by roguing.

Offermann (A. M.) & Vitoria (E. R). **Estudio sobre un virus productor del 'marchitamiento apical de la Papa'.** [Study on a virus producing 'top necrosis of the Potato'.]—*Rev. argent. Agron.*, viii, 2, pp. 105–113, 2 pl., 1941.

Under local conditions in the Argentine, the serious potato disease caused by *Solanum* virus 1 [potato virus X] is stated to be liable to confusion with early blight (*Alternaria solani*), dark chestnut, concen-

trically zonate foliar lesions being common to both; symptoms of the virus, however, occur on the young tissues and are confined to the upper side of the leaves, while the fungus attacks the older ones and further involves both leaf surfaces, imparting to the veins of the lower an almost black colour. The virus also affects the stems and tubers, causing necrosis of the terminal buds and eyes, respectively. The virus induces on tomatoes inoculated with expressed juice symptoms reminiscent of those due to *Lycopersicum* virus 3 [spotted wilt], but the two infective principles may be distinguished by their reaction to mercuric chloride, which at a strength of 1 in 1,000 immediately inactivates the spotted wilt virus, whereas potato virus X retains its virulence in contact with the disinfectant for five days. The potato virus is filterable through Kieselguhr H, Chamberland L5 and L3, and Berkefeld W and N candles; is inactivated partially at 65° and totally at 75° C.; tolerates a dilution of 1 in 1,000; retains its infective capacity for a fortnight in the refrigerator at 5°, but shows an appreciable diminution of virulence after two months under these conditions; and is pathogenic to tomato, potato, tobacco, chilli, and sometimes dahlia, but not to Calla lily [*Zantedeschia ethiopica*], a common host of spotted wilt in the Argentine.

The virus was purified according to Bawden and Pirie's technique [*R.A.M.*, xviii, p. 756] and the resultant opalescent, whitish solution inoculated into tomato plants at dilutions of 1 in 10 and 1 in 100 with positive results. The leaves of diseased plants were found to contain a higher proportion of the infective principle than the stems.

Flint (L. H.) & Edgerton (C. W.). **Fluorescence of diseased Potatoes.** —*Phytopathology*, xxxi, 6, p. 569, 1941.

In the course of routine inspections in Louisiana, the cut surfaces of potato tubers affected either by ring rot (*Bacterium sepedonicum*) or stem-end rot (*Fusarium* [*solani* var.] *eumartii*) were found to fluoresce under ultra-violet radiation, so that this phenomenon is not, as was thought by Harvey (*Phytopathology*, xxxi, p. 10, 1941), diagnostic for ring rot, which must be tested for with Gram stain.

Iverson (V. E.) & Kelly (H. C.). **Control of bacterial ring rot of Potatoes with special reference to the ultra violet-light method for selecting disease-free seed stock.**—*Bull. Mont. agric. Exp. Sta.* 386, 15 pp., 4 figs., 1940.

Mention has already been made of the successful results obtained in Montana in the detection of bacterial ring rot (*Phytomonas sepedonica* [*Bacterium sepedonicum*]) by means of a 100-watt, 220-volt, H-4 natural red-purple lamp (General Electric Company) [*R.A.M.*, xx, p. 274]. The examination should be made at storage temperatures in a well-darkened room. The best knife disinfectants were found to be acid mercury (1 in 500), mercuric chloride (1 in 500), and an iodine-potassium iodide solution made up by P. A. Ark (*in litt.*, unpublished) at the California Agricultural Experiment Station as follows: 37·8 gm. iodine, 75·6 gm. potassium iodide, 1 pint glycerine, and 2 gals. water (five-second dips in all cases), while the most effective tuber antiseptics were mercuric chloride (1 in 1,000, three minutes) and iodine solution, prepared as above with the omission of the glycerine and using only 1 gal. water

(three minutes), which reduced the incidence of infection from 86·3 to 4 and 6·1 per cent., respectively, the corresponding figures for new improved semesan bel and mercuric chloride 1 in 2,000 being 10 and 18·3 per cent., respectively. Semesan bel and the iodine mixture reduced the percentage of emergence by 12 and 2·2 per cent., respectively.

GODFREY (G. H.). **Potato seed-source control suggested for elimination of late blight in Lower Rio Grande Valley.**—*Plant Dis. Reptr*, xxv, 9, pp. 267–268, 1941. [Mimeographed.]

The circumstances [which are described in detail] attendant on a severe epidemic of late blight (*Phytophthora infestans*) in the spring potato crop in the Lower Rio Grande Valley, Texas, in 1941 suggest the rigid exclusion from the district of all seed except that originating in disease-free States (Nebraska and North Dakota, from which most of the seed is obtained, being virtually free from blight). This measure should effectively prevent the development of severe outbreaks of late blight in the Valley, since it is improbable that the causal organism, which thrives over a low temperature range, would survive a subtropical summer and no alternative hosts have been found to harbour it, while the likelihood of long-distance transmission from Louisiana or Florida is considered to be remote.

HAHN (G. G.). **Reports of Cedar blight in 1940 and notes on its previous occurrence in nurseries.**—*Plant Dis. Reptr*, xxv, 7, pp. 186–190, 1941. [Mimeographed.]

In recent years, blight (*Phomopsis juniperovora*) [*R.A.M.*, xix, p. 444] has become a difficult problem in those nurseries of the Mississippi Valley States where cedars are propagated; the disease is regarded as particularly serious in this area, as eastern red cedar (*Juniperus virginiana*) has increased in popularity locally for farmstead windbreaks.

In Iowa and Missouri, cedar blight in nurseries at Ames and Ellsberry was much less active in July, 1940, than at any time in the previous three years, apparently owing to a very dry spring. About the third week in July, however, an epidemic developed in two nurseries in Iowa, and became more severe than the outbreaks experienced in 1937 and 1938. In a two-acre area planted with *J. virginiana*, all of 2,000 seedlings examined were infected. Spread became greatly reduced in the first week of September, when dry weather set in. Between 20th July and 1st September the whole stock was rogued three or four times, with a total loss of approximately 30 per cent. The disease was quiescent during the dry, cold spring, but became rampant when exceptionally wet, cool weather developed in July and August.

In eastern Nebraska infection was worse during 1940 than at any other time in recent years. In a nursery at Fremont, Rocky Mountain juniper (*J. scopulorum*) was as badly infected as *J. virginiana*.

In Minnesota and Wisconsin, infection, though present, was light. During the year, the first authenticated record of the disease as a nursery problem in Oklahoma was received. Only one case appears to have occurred in Texas nurseries; this was in 1929, when the fungus was identified on *J. chinensis* seedlings introduced from Illinois. Specimens

of Italian cypress (*Cupressus sempervirens*) collected in Texas in 1928 bore *P. occulta* (*Diaporthe conorum*), and care should be taken not to confuse the fungus on Cupressaceous specimens with *P. juniperovora*.

In a Virginia nursery and another in North Carolina, infection was less serious than in the two previous years. Thin stands appeared to be a controlling factor, as in South Carolina, where the disease has not yet been recorded.

FINDLAY (W. P. K.) & PETTIFOR (C. B.). **Dark coloration in Western Red Cedar in relation to certain mechanical properties.**—*Emp. For. J.*, xx, 1, pp. 64–72, 2 graphs, 1941.

Experiments made to test the strength properties of samples of western red cedar (*Thuja plicata*) heartwood showing a dark red discoloration, as compared with the strength properties of samples having a normal colour, showed that the dark-coloured heartwood was about 20 per cent. less tough, softer, and weaker in compression than the normal-coloured heartwood. The dark material also had a lower specific gravity than the light, this difference being closely correlated with difference in strength.

The dark wood almost invariably showed the presence of mycelium, and it is concluded that the dark coloration, lower specific gravity, and reduced strength of the discoloured samples were due to fungal infection. It was observed that the hyphae had penetrated the cell walls in a manner described as typical for *Poria weirii* [*R.A.M.*, xx, p. 98], but the fungus has not so far been definitely identified. Until further evidence is available the dark coloration is regarded as an incipient stage of rot, possibly accompanied by fungi of the staining type.

RUMBOLD (CAROLINE T.). **A blue stain fungus, Ceratostomella montium n.sp., and some yeasts associated with two species of Dendroctonus.** —*J. agric. Res.*, lxii, 10, pp. 589–601, 4 figs., 1 map, 1941.

A Latin diagnosis and full description are given of a new blue stain fungus, *Ceratostomella montium* [*R.A.M.*, xx, p. 238], disseminated by the bark beetles *Dendroctonus monticolae* and *D. ponderosae*, which infest mountain pines in the central Rocky Mountain forests of the United States. The range covered by the joint attack of the two beetles and the fungus is so far known to extend from the Canadian border in the north to southern Utah in the south, comprising forests in Washington, Idaho, Wyoming, South Dakota, Colorado, and Utah. It is not known whether the fungus is associated with the beetles in other parts of their range. In culture the fungus did not tolerate high temperatures, growing well between 12° and 22° C. with an optimum at 16°. It is concluded, therefore, that the fungus is unlikely to spread far from the mountain forests. The fungus grows in the beetle and larval galleries under the bark and penetrates inner bark and wood, where the bases of perithecia are usually buried, their necks protruding into the galleries like thin black wire. The colour of infected sapwood ranges from grey to blackish green-grey. Young colonies of the fungus in culture are white, changing to warm sepia and black; young hyphae are hyaline, 1·3 to 4 μ in diameter; old hyphae are brown, septate, 4 to 8 μ in diameter; conidiophores are single, hyaline, at first simple, later

branched; conidia are hyaline, clustered or solitary, on hyphae and short conidiophores, globular, 4 to 5 μ, ovoid to clavate, 6·5 to 8 by 4 to 5 μ; the perithecia are black, globose, slightly hirsute, with a base 175 to 448 (mean 287) μ high and 162 to 410 (mean 278) μ wide and a neck longitudinally striate, 552 to 3,776 (mean 1,527) μ in length, 21 μ broad at the tip, and without ostiolar cilia; the asci ephemeral, clavate or ellipsoid; and the eight ascospores unicellular, hyaline, rectangular-parallelepipedal with square ends, 3·7 to 5·8 (mean 4·6) μ by 2·0 to 3·4 (mean 2·7) μ.

Besides *C. montium*, two yeasts, a fungus of the anascosporous mycelium-forming group and *Zygosaccharomyces pini* were found to be carried by the beetles.

Scheffer (T. C.), Wilson (T. R. C.), Luxford (R. F.), & Hartley (C.). **The effect of certain heart rot fungi on the specific gravity and strength of Sitka Spruce and Douglas-Fir.**—*Tech. Bull. U.S. Dep. Agric.* 779, 24 pp., 3 figs., 3 diags., 7 graphs, 1941.

A detailed study was undertaken in 1918 by the Division of Forest Pathology of the United States Department of Agriculture with the help of the Forest Products Laboratory on the effect of several decay fungi on the strength properties of infected Sitka spruce [*Picea sitchensis*] and Douglas fir (*Pseudotsuga taxifolia*) trees. The early stages of decay by *Polyporus schweinitzii* [*R.A.M.*, xix, p. 445] is marked by few visible symptoms; it is characterized by yellowish longitudinal streaks in the beginning, followed somewhat later by a light brownish discoloration, and finally the wood breaks up into cubical masses. The early stages of *Fomes pini* [*ibid.*, xix, p. 506] decay show reddish-brown discoloration, while later on the typical white pockets develop. The progress of strength reduction by *P. schweinitzii*, and similarly by *F. laricis* [ibid., xiv, p. 205], is not indicated by any sharp changes in the gradation of colour or other visible symptoms and there is little correlation between the appearance of the wood and the degree of decay or loss of toughness, while in the case of *F. pini* the appearance of white pockets marks a very definite stage and the extent of pocket formation definitely indicates the degree of loss of toughness. The initial effects of decay by *P. schweinitzii* were greater than those by *F. pini*, particularly on the toughness of the wood. Shock resistance tests indicated that a reduction in toughness of approximately 20 per cent. can be expected in Sitka spruce as a result of initial infection by *P. schweinitzii*, while the incipient stage of *F. pini* decay would show a reduction not much greater than 10 or 15 per cent., and one of 10 to 25 per cent. only when the pockets are formed. Specific gravity was not greatly affected in the early stages of *F. pini* decay, whereas in the case of *P. schweinitzii* there was a uniform decrease in specific gravity from the zone of earliest to that of greatest decay, although the whole kept well within the range of normal variations of specific gravity. Average reductions by *P. schweinitzii* in the most severely attacked wood were about 10 per cent. in specific gravity, 30 per cent. in maximum crushing strength in compression parallel to grain, and 95 per cent. in toughness, the corresponding figures for *F. pini* in the late pocket stage being about 30, 70, and 95 per cent. respectively.

It is concluded from these results that a study of the effect of one fungus on the several properties and the effect of a second fungus on a single property does not form a reliable basis for estimating the effect of the latter fungus on the other properties. The effect of the fungi seemed greater in wood tested in the green condition than when dry wood was used, but the differences were not very large. While wood badly decayed by *F. pini* and *P. schweinitzii* was inferior in strength, sound wood close to an infected area was normal in strength properties. It thus appears that large parts of somewhat decayed trees may be safely used even where strength is of high importance provided that the limits of decay in those trees are established. The analysis of variability seems to indicate that there is a tendency towards a greater coefficient of variation in toughness as a result of decay by all three fungi studied, although in the case of *P. laricis* this tendency is not apparent further than the outermost zone of decay, the variability in the deeper rotted parts, while greater than in the sound wood, being considerably less than in the marginal decay.

In view of the fact that the large reduction in strength, and particularly shock resistance, caused by *P. schweinitzii* even in its early stages is not indicated by any external change of appearance in the wood, it is suggested that some method, possibly a staining test, should be evolved for the detection of decay. The toughness test used in the present study is recommended for the selection of suitable wood where maximum strength is essential. In this test the specimen block is broken in bending by a single impact applied by a pendulum machine, in which the pendulum is released from a predetermined angle and the angular position to which it swings after the specimen is broken is read from a graduated arc; from these known angles the heights of the centre of gravity of the pendulum assembly before release and after breaking the specimen are found, and the difference between these heights multiplied by the weight of the assembly represents the energy absorbed by the specimen and is the value on which the comparisons between sound and infected wood are based.

GIBSON (A. J.). **Wood and its preservation by means of paint and varnish.** —*Emp. For. J.*, xx, 1, pp. 39–49, 1941.

After concisely reviewing the history of the use of paints and varnishes from the earliest times, the author discusses the raw materials used in their manufacture, and concludes with brief recommendations for painting and varnishing wood.

CONARD (A.). **Sur la germination des spores de Coniophora cerebella.** [On spore germination in *Coniophora cerebella*.]—*C.R. Soc. Biol., Paris*, cxxxiv, 6, pp. 269–270, 5 figs., 1940.

In laboratory experiments at the Jean Massart Experimental Garden, Brussels, a fragment of a thoroughly desiccated fructification of *Coniophora cerebella* [*C. puteana*] gave rise to conidia, a small number of which germinated after 14 hours in daylight. The formation of the first germ-tube is succeeded by that of another in a diametrically opposite position. The hyphae are septate, profusely branched, and form numerous anastomoses; crescent-shaped, usually bicellular conidia are

produced at the tips of the branches, their numbers amounting to thousands by the end of 20 days, and germinate immediately at one or both extremities in cultures enriched with sawdust.

WALKER (J. C.), MCLEAN (J. G.), & JOLIVETTE (J. P.). **The boron deficiency disease in Cabbage.**—*J. agric. Res.*, lxii, 10, pp. 573–587, 6 figs., 1941.

In greenhouse experiments in Wisconsin, young cabbage plants grown in sand-nutrient cultures rapidly developed symptoms of boron deficiency [*R.A.M.*, xvii, p. 717] such as leaf distortion, early death of the growing point, and general stunting. In soil, both in the greenhouse and the field, the deficiency symptoms developed more slowly and field-grown cabbage plants often showed no external signs of disease. The chief internal symptom was a breakdown of the pith, which was, however, more frequent in cauliflower than in either cabbage, kale, collard (*Brassica oleracea* var. *viridis*), or sprouting broccoli. In varietal tests of cabbage, the early-maturing Golden Acre and Resistant Detroit showed the greatest amount of internal breakdown. The disease was greatly reduced in cabbage by the application of 20 lb. borax per acre but complete elimination could not be achieved even by applications of 60 lb., while the more susceptible cauliflower was completely healthy after a 40-lb. treatment. The borax treatment remained effective in the second successive cabbage crop without a further application. Soil treatment with salts of manganese, copper, iron, zinc, and sodium had no effect upon internal breakdown.

WOODMAN (R. M.). **The nutrition of Lettuces grown as sand cultures under glass. The nutrition of Turnips. The nutrition of the Spring Cabbage.**—*Ann. appl. Biol.*, xxvii, 1, pp. 5–16, 1940; xxviii, 1, pp. 1–7, 1 pl.; 3, pp. 12–188, 1 pl., 1941.

This is a series of three papers dealing with the responses of lettuce, turnip, and cabbage to applications of nitrogen, phosphorus, potassium, boron, calcium, and magnesium, giving the symptoms induced by deficiencies of these elements and the effects upon yield.

BAYLIS (G. T. S.). **Fungi which cause pre-emergence injury to garden Peas.**—*Ann. appl. Biol.*, xxviii, 3, pp. 210–218, 1 pl., 2 graphs, 1941.

Pea seeds sown during 1937–8 in the field were found to succumb to a pre-emergence attack by fungi, the period of maximum susceptibility being in the early stages of germination, even before the embryo had broken through the seed coat. The seedling axes yielded almost exclusively species of *Pythium*, whilst isolations from the cotyledons included *Ascochyta pisi*, *Pleospora* sp., *Fusarium* spp., and other fungi. Of the isolates tested only species of *Pythium* and a species of *Fusarium* were capable of inhibiting emergence in sterilized soil under conditions compared with those obtaining in the field, while *A. pisi* and *Pleospora* sp., which were probably responsible for reduced emergence of Pilot peas in the field in 1937, exercised little or no effect. The disease is therefore attributed principally to species of *Pythium*. These did not differ widely in pathogenicity and were conidia-bearing strains with the

exception of two which developed sexual organs and are referable to *P. de Baryanum* and *P. ultimum*.

Crosier (W.) & Heit (C. E.). **Response of germinants from Beans, Corn, and Peas to seed treatments with hormones and mercurials.**—*Proc. Ass. Off. Seed Anal. N. Amer. 1940*, pp. 88–92, 2 graphs, 1941.

During the routine germination of unselected stocks of seeds of dry shell and snap beans [*Phaseolus vulgaris*], maize, Lima beans [*P. lunatus*], and peas indole-acetic acid, indole-butyric acid, and α-naphthalene-acetamide [*R.A.M.*, xx, p. 521] (0·1 per cent., as 'rootone') were dusted on the dry seeds immediately before these were placed in the germinators, the hormones being suspended in an inert carrier having an adherence rate of about 2 oz. per bush. Ceresan was also included in the tests.

The results obtained showed that with peas, 'rootone' gave 48·1 per cent. seeds or seedlings infected with *Rhizopus nigricans*, 18·2 with *Penicillium* spp., and 20·9 per cent. with bacteria, whilst the corresponding percentages for ceresan were 12·4, 1·7, and 0·8, and for the controls 51·5, 21·8, and 20·6. Similar results were obtained with beans and maize, none of the hormones reducing fungal or bacterial infection. In some instances, α-naphthalene-acetamide increased the percentage of contaminated seedlings.

As measured in percentages of normal sprouts, the response of pea seed stocks to additions of any hormone was negative.

The germination of Lima beans was commonly less for the treated than for the untreated seed. The results from garden beans and maize were inconsistent. The differences in percentages of germination between the hormone-treated and the untreated seed were not significant.

Murphy (D. M.). **Bean improvement and Bean diseases in Idaho.**—*Bull. Idaho agric. Exp. Sta.* 238, 22 pp., 11 figs., 1940. [Abs. in *Exp. Sta. Rec.*, lxxxv, 1, p. 71, 1941.]

Several strains of the Great Northern bean [*Phaseolus vulgaris*] variety resistant to common mosaic have been developed at the Idaho Agricultural Experiment Station, and the latest release, Great Northern U.I. 15, is also resistant to curly top [*R.A.M.*, xviii, p. 296], while two new selections of Red Mexican, U.I. 3, and U.I. 34, likewise combine resistance to both viruses. Data are presented showing the percentages of common and yellow bean mosaics and curly top and the length of the growing season in several Great Northern selections. The symptoms of bean diseases of importance in the State, where seed and dry bean production is a major industry, are described and control measures recommended.

Harter (L. L.) & Zaumeyer (W. J.). **Differentiation of physiologic races of Uromyces phaseoli typica on Bean.**—*J. agric. Res.*, lxii, 12, pp. 717–731, 3 pl., 1941.

Twenty physiologic races of bean rust, *Uromyces phaseoli typica* [*U. appendiculatus*: *R.A.M.*, xx, p. 43], were distinguished in the greenhouse on seven differential host varieties, namely, U.S. No. 3, a white-seeded

Kentucky Wonder type; Bountiful No. 181, a garden bean of the bush type; a strain of California Small White, No. 643, a field bean; a strain of Pinto, No. 650, a speckled field bean; a selection, No. 765, from the Kentucky Wonder Wax variety; a medium-late white-seeded Kentucky Wonder hybrid, No. 780; and a brown-seeded Kentucky Wonder hybrid No. 814, from material received or collected from several localities in the United States and the Hawaiian Islands. Race 5 seemed to be more prevalent and more widely distributed than most of the others. Generally, bean rust appeared to be limited in its distribution to regions with a relative humidity of not less than 95 per cent. for 8 to 10 hours at the time when viable conidia are present. The degree of infection was found to be influenced by light, heat, and length of day. Thus, a grade 1 infection on a scale ranging from 0 to 10 in the winter months would often become grade 2 or 3 on certain varieties inoculated in the spring or autumn. Brown, necrotic lesions varying greatly in shape and size characteristically developed on the under side of the leaf of resistant plants about three days after inoculation, whereas the small flecks, which later develop into large pustules, appeared on more susceptible plants only after about five days. It was thus possible to determine resistant plants before any visible symptoms appeared in susceptible varieties. In varietal resistance tests with races 1 to 14, field beans appeared generally more susceptible to most races than the garden varieties, with the exception of race 10, to which the opposite applied. For each race there were a few varieties highly resistant or immune, so that at least one parent could be found for breeding disease-resistant varieties. It was observed that two or three races may be present in one locality during a single year, but they did not necessarily recur in succeeding years and were sometimes replaced by entirely different ones. Usually one race was greatly predominant over the others. Uredospores remained viable for as long as two years if the leaves were dried for a few days at room temperature and then stored at —20° C.

Parris (G. K.) & Matsuura (M.). **A second strain of Bean rust in Hawaii.**—*Plant Dis. Reptr*, xxv, 11, pp. 311–312, 1941. [Mimeographed.]

The bean [*Phaseolus vulgaris*] varieties Lazy Wife, Rust Resistant-Morse's 191, Kentucky Wonder Brown Seeded Rust Resistant, and Kentucky Wonder Rust Resistant Brown Seeded, previously considered as resistant to rust (*Uromyces phaseoli typica*) [*U. appendiculatus*: *R.A.M.*, xviii, p. 366 and preceding abstract] in Hawaii have now been ascertained to be susceptible, showing that a second form or strain of the fungus is now present. A list is given showing the reactions of 35 bean varieties to infection in Hawaii in 1941 and 1938.

Whitaker (T. W.) & Pryor (D. E.). **The inheritance of resistance to powdery mildew (Erysiphe cichoracearum) in Lettuce.**—*Phytopathology*, xxxi, 6, p. 534–540, 2 figs., 1941.

An account is given of the writers' studies in southern California on the inheritance of resistance to powdery mildew (*Erysiphe cichoracearum*) in the progeny of crosses between the resistant Imperial 850 lettuce and the susceptible wild *Lactuca scariola*. The race of the fungus on *L. scariola*

is characterized by conidia ranging from 33·8 to 63·8 by 18·8 to 31·9 (mean 45·38 by 25·88) μ, the corresponding dimensions for the brown, globose perithecia, hyaline, stalked, more or less elliptical asci, and ovate to ellipsoid ascospores being 124 to 169 by 124 to 169 (137·2 by 137·2) μ, 64 to 86 by 34 to 49 (77·3 by 42·6) μ, and 30 to 45 by 15 to 26 (34·9 by 19·1) μ, respectively.

All the 10 F_1 plants tested appeared to be resistant to the disease, and the data obtained from the offspring of the four plants saved indicated the operation of a single dominant gene in the control of immunity. Of the 11 F_3 families derived from eight F_2 plants, eight were heterozygous, two homozygous-susceptible, and one homozygous-resistant. With one exception the heterozygous families segregated in the expected 3 : 1 ratio, confirming the F_2 data in respect of the dependence of resistance on a single dominant gene.

Cook (H. T.). **Late blight of Celery in Virginia.** —*Plant Dis. Reptr*, xxv, 11, pp. 311, 313, 1941. [Mimeographed.]

In 1940, following cool weather which persisted until late in the season, *Septoria apii* became very destructive on celery in the Norfolk area of Virginia. No infection occurred on one farm where four-year-old seed was used that had been rejected because of poor germination, while on another farm it was much lighter on plants grown from old than from new seed. Spraying [cf. *R.A.M.*, xix, p. 507] had little effect in checking the disease on plants from new seed, but was effective on plants from old seed. Six growers together submitted about 25 lb. of seed for treatment, which was dipped in water at 118° F. for 30 minutes, and afterwards rinsed in cold water and dried. Treatment had little, if any, adverse effect on germination, and no infection developed (May, 1941) on any farm that used the treated seed, though infection was very destructive on plantings of growers who had neglected to have their seed treated. Two growers who had their seed treated obtained a number of plants from neighbours whose seed had not been treated, and on both these farms only the beds set with the neighbours' plants developed blight. As the treated seed gave no disease in 1941, though planted in fields badly affected a year before, it would appear that *S. apii* was not able to survive in the soil under the climatic conditions that prevailed from July, 1940, to March, 1941.

Wann (F. B.). **Control of chlorosis in American Grapes.**—*Bull. Utah agric. Exp. Sta.* 299, 27 pp., 8 figs., 1941.

This is an expanded, tabulated account of a series of experiments in the control of vine chlorosis conducted in Davis and Weber Counties, Utah, from 1928 to 1940, a note on which has already been published from another source [*R.A.M.*, xx, p. 101]. Temporary recovery followed the insertion of iron ammonium oxalate or citrate, iron phosphate, or iron citrate salts, in the form of $\frac{1}{2}$ gm. capsules, into holes in the bark, or several applications of iron sulphate (10 lb. per 100 gals.), but the only practicable method of combating the disease with lasting effects is by grafting scions of the widely grown susceptible Concord (American labrusca) variety on European vinifera stocks, e.g., Rose of Peru, Tokay, Muscat, and Malaga, the chlorosis ratings of grafts on which in recent

tests, taking 0 to represent complete freedom from the trouble, were 0·07, 0·30, 0·13, and 0·38, respectively.

Hulpoi (Aurelia). **Câteva boale criptogamice noi apărute în anul 1939 în România.** [Some cryptogamic diseases appearing for the first time in the year 1939 in Rumania.]—*Viața agric.*, xxxi, 5, pp. 134–138, 5 figs., 1940.

Descriptions are given of the symptoms of three diseases observed for the first time in Rumania during 1939, viz., leaf mould of tomato (*Cladosporium fulvum*), shot hole of plums (*Clasterosporium carpophilum*), and *Cylindrosporium castanicolum* (the imperfect stage of *Mycosphaerella maculiformis*) [*R.A.M.*, xviii, p. 355] on sweet chestnuts, together with observations on the life-histories of the causal organisms and directions for their control.

N.S.W. Department of Agriculture. Biological Branch—Division of Science Services. Plant disease survey for the twelvemonth period ending 30th June, 1941. Eleventh Annual Report.—30 pp., 1941. [Mimeographed.]

This valuable survey of the diseases affecting economic and ornamental crops in New South Wales has been compiled by officers of the Plant Pathological Section, Biological Branch, Department of Agriculture, from information accumulated during the year ending 30th June, 1941. A number of the more important records have already been noted from other sources [cf. *R.A.M.*, xx, p. 342 and next abstracts].

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, lii, 7, pp. 369–371, 384, 3 figs.; 8, pp. 435–438, 5 figs., 1941.

Two of the most serious gladiolus diseases in New South Wales are scab (*Bacterium marginatum*) [*R.A.M.*, xix, p. 22] and hard rot (*Septoria gladioli*) [ibid., xx, p. 20], notes on the symptoms and control of which are given.

All growers of early-sown maize in coastal districts and all maize-growers in tableland areas are strongly advised to dust their seed with agrosan or ceresan (2 oz. per bush.), preferably a few days before sowing, in order to prevent defective germination and seedling blight [*Gibberella fujikuroi* and its var. *subglutinans* and *G. saubinetii*].

Stone fruit-growers are reminded that pre-blossom application of a fungicidal spray not only controls leaf curl [*Taphrina deformans*: ibid., xix, p. 549; xx, p. 244], but is also of value against rust [*Puccinia pruni-spinosae*: ibid., xix, p. 418; xx, pp. 195, 369], freckle [*Cladosporium carpophilum*: ibid., xix, p. 69], and brown rot [*Sclerotinia fructicola*: ibid., xix, p. 550]. Considered purely as a fungicide, Bordeaux mixture (6–4–40) is the best material, but if a spray is required that also possesses insecticidal properties, lime-sulphur (1 in 10 to 1 in 20) should be used. Either white or pale spraying oil may be used in combination with Bordeaux mixture, but only the latter can be employed with lime-sulphur. The inclusion of a small amount of either oil (generally $\frac{1}{2}$ to $\frac{3}{4}$ gal. per 100 gals. spray) enhances the fungicidal value of Bordeaux mixture.

During the 1940–1 season, boron deficiency symptoms reappeared on some blocks of pear trees in the northern tablelands. Soil treatments with borax [see below, p. 585] had been made in the autumn of 1937, but in the cases noted internal cork and surface cracking reappeared. Growers who failed to apply borax soil treatment during the current season may resort to spraying.

New records included *Alternaria herculea* [*A. brassicae* (Berk.) Sacc.] causing leaf spot of turnips, and *Sclerotinia sclerotiorum* on jute (*Corchoris capsularis*), sunn-hemp (*Crotalaria juncea*), and hemp.

Annual Report, Cawthron Institute, Nelson, New Zealand, 1940.—38 pp., [? 1941].

The sections of this report dealing with fruit and tobacco research (pp. 17–28) at the Cawthron Institute, New Zealand, in 1940 contain the following items of interest. A definite response to the use of different magnesium compounds applied as top dressings was obtained in several apple orchards affected with magnesium deficiency [*R.A.M.*, xx, p. 68]. The condition was also controlled by the injection of magnesium sulphate solution into affected Jonathan, Cox's Orange, and Sturmer trees. With Cox's Orange, for example, an injection of 0·84 gm. magnesium gave 0·45 per cent. magnesium oxide in leaf dry matter, with no symptoms of deficiency, one of 0·5 gm. gave 0·3 per cent. magnesium oxide with a very slight trace of deficiency, one of 0·42 gm. plus 0·54 gm. calcium (as acetate) gave 0·19 per cent. magnesium oxide with fairly severe deficiency symptoms, and one of 0·25 gm. plus 0·32 gm. calcium gave 0·18 per cent. magnesium oxide with a small amount of deficiency. The control, into which distilled water was injected, showed 0·14 per cent. magnesium oxide in leaf dry matter, with very severe deficiency. A soil dressing of ground limestone at the rate of 24 lb. per tree increased the severity of magnesium deficiency symptoms. Taken as a whole, the results so far obtained show that marked benefit has resulted from the use of magnesium compounds, especially magnesium carbonate and sulphate, but that commercial control has not yet been achieved.

Soil top-dressings of borax ($\frac{1}{2}$ and 1 lb. per tree) again increased internal breakdown in Jonathan apples, but less so than in earlier experiments [ibid., xix, p. 604]. Borax applications continue to give satisfactory control of apricot brown spotting [ibid., xix, p. 30], while cherry trees treated with borax have remained free from 'pitting' trouble, though untreated trees are affected.

Applications of magnesium carbonate (100 lb. per acre) and burnt dolomite (250 lb. per acre) controlled tobacco sand drown (or magnesium deficiency) [ibid., xvi, p. 637], which adversely affected yield and leaf quality, and increased the magnesium oxide of the leaf samples to 0·33 and 0·12 per cent., respectively, compared with 0·09 per cent. in the control. The condition was present in several areas.

Nattrass (R. M.). **Plant diseases in Kenya during 1940.**—*E. Afr. agric. J.*, vii, 1, p. 57, 1941.

During 1940, the following new disease records were made in Kenya. Carrots in the Sotik area became infected by a fungus agreeing with

Macrosporium carotae [*R.A.M.*, ii, p. 6; xix, p. 517]; the disease has not been reported from elsewhere in East or from South Africa. *Elsinoe phaseoli* [ibid., xviii, p. 58] caused serious infection of *Phaseolus aureus*, attacking the leaves, stems, and pods. Papaws in one plantation developed a black, leathery rot due to *Ascochyta caricae* [ibid., xvii, p. 259; xx, p. 152]. The rot was distinguished from that caused by *Gloeosporium* sp. by the closely aggregated pycnidia from which, under moist conditions, white spore tendrils protrude. The spores (mostly bicellular, with one cell often larger than the other) measured 8 to 11 by 3 to 4 μ. Many pycnidia contained only unicellular spores, but typical *Ascochyta* spores developed later.

A serious disease attacked many of the *Stapelia* species in Nairobi, beginning as deeply sunken lesions up to 1 cm. in diameter, which rapidly became confluent. The aerial parts turned black and shrivelled up. The bottom of each cavity was covered with cespitose, completely immersed pycnidia without a stroma, measuring approximately 150 by 125 μ in diameter, and more or less wide open at maturity. The uni- to biseptate spores measured 40 to 60 by 3 to 4 μ. The fungus is considered to be a hitherto undescribed species of *Phleospora*.

A large proportion of die-back and crown rot in a commercial lavender planting was associated with a species of *Phomopsis*, though the primary cause of the disease is believed to be a splitting of the crown and main branches.

Melanospora parasitica [ibid., xii, p. 216] occurred on *Cephalosporium* sp. attacking *Pseudococcus kenyae*.

Oidiopsis taurica caused a leaf spot of *Tropaeolum* sp., and *Verticillium dahliae* a wilt of eggplant.

A further physiologic race (K6) of wheat stem rust [*Puccinia graminis*] appeared on Reliance wheat, hitherto susceptible only to K3 [cf. ibid., xix, p. 76].

THOMPSON (A.). **Notes on plant diseases in 1940.**—*Malay. agric. J.*, xxix, 6, pp. 241–245, 1941.

Two of the more important fungi associated with leaf base and stem tissue decay in felled oil palms are *Fomes noxius* and *Ganoderma applanatum* var. *tornatum* [*R.A.M.*, xx, p. 7]. The latter has not been definitely observed as an agent of disease in standing palms, but in view of its apparent relation to a stem decay of palms 'replanted' by felling after cutting the roots on the 'off' side of the stem, its further activities will be watched. Young palms growing in nutrient solutions without nitrogen develop yellowing; without magnesium, chlorosis and browning are followed by death; and without potassium yellowing is accompanied by brown scorch of the tips of the pinnae.

Marasmius palmivorus [ibid., xvii, p. 162] was responsible for an outbreak of leaf disease in dwarf coco-nut palms during the heavy rains in Lower Perak in the last quarter of 1940. Treatment consisted in the pruning of the affected foliage, the clearance of debris from the crown, and improvement of the drainage system. The greater humidity in the crown region and the earlier accumulation of debris therein in dwarf as compared with tall palms probably account for the susceptibility of the former to *M. palmivorus*.

A cracking of the bark of young areca nut stems on the side facing west during a protracted drought, followed by a black rot of the inner tissues extending for several feet up and down the stem, is tentatively attributed to sun scorch, aggravated by the dry weather, *Pestalozzia* sp. and *Thielaviopsis* sp., isolated from the infected parts, having given negative results in inoculations.

A *Piricularia* similar to *P. oryzae* causing severe leaf spot of *Eleusine coracana* [ibid., xix, p. 259] at Serdang failed to infect rice in cross-inoculation tests.

Coix lacryma-jobi was heavily infected but little damaged by *Phyllachora coicis*.

Fifty-third Annual Report of the Kentucky Agricultural Experiment Station for the year 1940. Part I.—67 pp., 1941.

In this report on plant disease work in Kentucky in 1940 [*R.A.M.*, xix, p. 678] it is stated that nine strains of Burley tobacco tested on 500 farms were found to be highly resistant to mosaic, to make good growth, and to produce satisfactory cured tobacco; all, however, were unsuitable for general planting. Other new strains with Ambalema type of resistance and almost identical with Ky 16 should prove more satisfactory than the strains so far tested.

In 103 fields tended by men who used barn-cured tobacco, mosaic infection ranged from 2 to 96 per cent. of all the plants, and averaged over 20 per cent. In 39 fields where the workers did not use barn-cured tobacco infection was present in 1 per cent. or under of the plants in 27 fields, while only in two fields did the figure reach even 8 per cent.

Of six distinct strains of tobacco ring spot, five caused bleaching; the sixth induced chlorosis and necrosis of new leaves when the temperature was reduced to about 20° C. After the inoculated plants had passed the ring spot stage of the disease, conspicuous chlorosis and, sometimes, necrosis developed on plants infected by five of the strains, whenever the temperature was reduced to about 20°. These results and the fact that all strains cause some pollen sterility are considered to prove that tobacco plants infected by ring spot do not recover and cannot be regarded as having developed immunity.

Cercospora nicotianae [ibid., xx, p. 181] was isolated from 405 of 423 green spots on 76 leaves of cured Burley tobacco from as many different farms. A tobacco leaf decoction agar was prepared, on which the fungus sporulated freely. When tobacco leaves were sprayed with the spores through an atomizer and kept in a humid atmosphere, typical lesions developed in 10 to 12 days. If inoculated plants were cut before infection had become visible, green spots appeared while curing was in progress.

Owing to cool weather after setting, black root rot (*Thielaviopsis basicola*) [ibid., xx, p. 88] was unusually injurious to non-resistant strains of tobacco in the dark tobacco areas. Of 272 fields examined, 41 per cent. showed a reduced yield, though Ky 16 Burley grew normally in fields where the local varieties were seriously affected.

Black shank (*Phytophthora parasitica* var. *nicotianae*) [ibid., xx, p. 187] was observed in central Kentucky for the first time. In Georgetown, infection seems to have occurred first in 1932, on a plot on which

sweepings from a seed and fertilizer warehouse had been scattered. The fungus was carried to other plantings by machinery used on the land. Owing to the long rotations used locally, spread of infection will probably be slow.

Much of the land planted to tobacco in western Kentucky was found to be low in available potassium; this causes leaf conditions which are often confused with bacterial leaf spot. In many fields, potassium starvation was associated with soil rendered almost neutral by liming. Frenching was found in 11 fields.

Tomatoes sprayed twice with yellow copper oxide (3 lb. per 100 gals. of water) gave better growth than others sprayed twice with Bordeaux mixture (4–4–50), though no difference was noted in the amount of disease [unspecified] developing on the foliage.

In the sixth year of inspection, no phony peach [ibid., xviii, p. 323] was found. The only county where an infected tree has been found in the past three years is Webster, where one was discovered in 1939.

Plant pathology.—*Rep. Fla agric. Exp. Sta., 1939–40*, pp. 105–120, 1 fig., [? 1941].

This report on plant disease work in Florida in 1939–40 [cf. *R.A.M.*, xviii, p. 788] contains the following items of interest. A. H. Eddins states that the loss from potato bacterial ring rot [*Bacterium sepedonicum*: ibid., xx, p. 520] in the Hastings area was estimated at 0·5 per cent., and was almost entirely confined to 1,000 acres planted with selected seed reported to show a trace of infection in Maine. In the remaining 11,000 acres planted with certified seed, the disease was found in only two fields. No infection developed in plants originating from clean seed grown in soil 'seeded' with affected tubers in 1938, and none was observed in the progeny of tubers produced in this infested soil in 1939. The condition was not transmitted from affected plants in one row to healthy plants in adjacent rows. Spread from the cutting knife was prevented by treatment with mercuric chloride solution (1 in 1,000 for 5 minutes), or formalin (40 per cent. diluted 1 in 15 for 10 minutes or 1 in 30 or 60 for 15 minutes).

There was no significant reduction in the total yield of Katahdin potato tubers in plots containing not more than 32 per cent. spindle tuber [ibid., xx, p. 221], but in plots 100 per cent. affected the average yield was 52·7 bush. per acre less than that in healthy plots.

Seedling isolations demonstrated that *Rhizoctonia* may be one of the most important factors determining initial stands of watermelons, while three species of *Pythium* were also isolated [ibid., xx, p. 343], and *Colletotrichum lagenarium* [ibid., xix, p. 190] was present to a slight extent.

In further tests by A. S. Rhoads, *Armillaria mellea* and *Clitocybe tabescens* [ibid., xviii, p. 789; xx, p. 68] were grown in culture at P_H values from 4·2 to 7·1. After six weeks, the average amount of growth was about the same in all series. Most of the *C. tabescens* cultures developed masses of embryonic sporophores, though *A. mellea* in no instance showed any fruiting. Recent commercial plantings of Jewel peaches showed serious root rot due to *C. tabescens*. Infection appeared when the plantings were two years old, the number of trees attacked

increasing rapidly with age. A total of 154 different hosts have so far been found infected in Florida. By the end of May, 1940, five of the 16 *Casuarina equisetifolia* trees experimentally inoculated with *C. tabescens* in November 1938 and two of the controls were completely girdled and dead.

Observations by W. B. Tisdale and G. D. Ruehle showed that many lime trees [*Citrus aurantiifolia*] became chlorotic and unthrifty before there were any signs of invasion of the bark and wood by *Diplodia* sp. [cf. ibid., xiv, p. 86] and *Phomopsis* sp. These trees showed constricted lines or patches in the bark, and underneath such areas the wood was discoloured and gummy. In 1939, 30 buds from affected trees were placed on rough lemon seedlings. Of the 21 that grew, only one appeared healthy in January, 1940. This chlorotic condition appears to be due to a virus and to be transmitted through the budwood.

Data obtained by K. W. Loucks showed that of numerous vine varieties Madeline Angevine was least susceptible to black rot [*Guignardia bidwellii*: ibid., xix, p. 25] and Urbana to bitter rot [*Glomerella cingulata*: ibid., xvi, p. 17]. With both diseases, the rootstock used made no appreciable difference to susceptibility, except in the case of Niagara, which was most susceptible to the former disease on Beacon and least so on Herbemont and Lukfata, while it showed 89 and 39 per cent. bitter rot on Lukfata and Champinii, respectively.

A. N. Brooks states that frost injury to celery facilitated infection by *Sclerotinia sclerotiorum* [ibid., xx, p. 4], while low temperatures stimulated the development of apothecia and ascospores. In fields treated neither by flooding nor by cyanamide application crop loss reached 35 per cent., while where flooding alone was used the figure was 10 per cent., and where both flooding and cyanamide treatment were adopted, 5 per cent.

Annual Report of the Agricultural Experiment Station, Río Piedras, Puerto Rico, 1938–39.—99 pp., 13 figs., 9 graphs, [? 1940]; **1939–40.**—66 pp., 11 figs., [? 1941].

Among the numerous items of phytopathological interest included in the first report, the following may be mentioned. Bananas and plantains showing symptoms of 'twisted top' [*R.A.M.*, xvi, p. 114] at an early stage of growth were observed by M. T. Cook and A. R. Lopez to reach maturity in a normal way and bear fruit, while suckers from the affected plants developed without signs of the trouble. Similar results were obtained with suckers from bunchy top plants. The same workers state that banana leaf spot (*Cercospora musae*) has only recently begun to appear in a severe form in the Island, especially on the Dwarf Montecristo variety on unduly exposed sites. Good control was obtained in an experiment at San Sebastián by the removal and destruction of the lower, heavily infected leaves, followed by the application of 4–4–50 Bordeaux mixture to the remainder of the foliage, but the expense of this treatment would be too great for commercial use and the development of resistant varieties is regarded as the only practicable measure of control.

A burning of yam [*Colocasia esculenta* and *C. antiquorum*] foliage in experimental plots was tentatively attributed to the effects of Bordeaux

mixture, but the same condition developed naturally in six varieties. A species of *Fusarium* with a white mycelium was isolated from the roots and stem bases of dead yams near San Germán, where a patch of some 2,000 in a large plantation were affected.

A. Roque's experiments showed the new Río Piedras Station strains of cucumber, 39 and 40, which are resistant to downy mildew [*Pseudoperonospora cubensis*], to be much better yielders than the commercial varieties Black Diamond and Early Fortune, the total yields in cwt. per acre of the four sorts (in the order named) being 181·7, 180·6, 132·8, and 105·7, respectively, and the corresponding percentages of marketable fruit 57·4, 57·3, 39·9, and 32·8, respectively. In this series of tests the new strains were not sprayed against the disease, while the commercial varieties received eight applications of Bordeaux mixture. The cost of combating *P. cubensis* on susceptible varieties ranges from $30 to 50 per acre, and it is estimated that a complete replacement of those now under cultivation by the new resistant selections would represent an added annual revenue to growers of $50,000.

Serious damage to the Puerto Rican [chilli] pepper crop is caused by a mosaic disease stated by A. Roque and J. Adsuar to be due to a virus quite distinct from that of tobacco mosaic, responsible for a similar disease in the United States. The small, native, mild peppers used for seasoning food are highly susceptible to infection under local conditions, and probably serve as the chief sources of dissemination, while one of the indigenous hot types is very resistant and may provide suitable material for breeding trials.

P. R. Kuntz has developed a new sugar-cane variety, PR–900, combining vigorous growth with freedom from arrowing and immunity from mosaic and gumming [*Xanthomonas vasculorum*].

In the second report, L. A. Alvarez states that inoculation tests failed to demonstrate the pathogenicity to coffee of *Rosellinia bunodes* [ibid., xvi, p. 778]. A species of *Fusarium*, however, isolated from diseased material, was found to cause severe wilt under favourable conditions. The disease was most prevalent in medium-wet soils, at P_H values 4·53 to 5·57.

Cassava was attacked by *Gloeosporium manihotis* [ibid., xii, p. 680]. Small, light green spots appeared on the leaves, and enlarged rapidly under moist conditions until they covered a great part of the leaf. Affected stems and twigs died back.

In a comparative test by A. Roque, unsprayed cucumbers of varieties 39, 43, 40, and 37, resistant to mildew [*Pseudoperonospora cubensis*: see above] yielded, respectively, 176·8, 150·4, 147, and 132·8 cwt. per acre, as against 111 and 95·2 cwt., respectively, for the commercial varieties Black Diamond and Early Fortune, when sprayed with Bordeaux mixture (2–2–50), and 50·8 and 29·6 cwt. for the same varieties, respectively, when unsprayed. The yield of the varieties, 37, 39, and 40 was adversely affected by spraying.

L. A. Alvarez states that cucumbers in Rio Grande maturing as rainfall became abundant were attacked by 'cottony leak' [*Pythium aphanidermatum*: cf. ibid., v, p. 71]. Characteristic symptoms of mosaic were observed on cucumbers about to be picked; the first lot of fruit gathered was marketable, but the last was much discoloured, and the

surrounding plantations became so severely infected that they had to be destroyed. Cucumbers on arrival in New York were affected by black rot due to a species of *Mycosphaerella*, infected fruits subsequently being noted in the vicinity of Rio Grande. Infection declined at the end of the rainy season.

A. Roque states that in a comparative trial in infected soil the new eggplant varieties Puerto Rican Beauty and E–12, which are highly resistant to bacterial wilt [*Bacterium solanacearum*], showed only 12 and 20 per cent. infection, respectively, as against 68 per cent. for Florida High Bush and 91 per cent. for Black Beauty. Both new varieties gave high yields and fruit of better quality than the commercial varieties.

L. A. Serrano states that in commercial plantings of papaw, 86·6 per cent. of the plants became infected by mosaic [ibid., xviii, p. 808].

N. A. Schappelle points out that many local growers have to spray their pineapple plants with iron sulphate to prevent chlorosis, though the soil in which the plants are growing is rich in iron and manganese. Water culture experiments demonstrated that the plants contain sufficient iron for normal growth, but that the iron from the soil becomes unavailable unless the manganese is rendered ineffective.

Shands (R. G.). **Disease resistance of Triticum timopheevi transferred to common winter Wheat.**—*J. Amer. Soc. Agron.*, xxxiii, 8, pp. 709–712, 1 fig., 1941.

Details are given of hybridization work at the Wisconsin Agricultural Experiment Station culminating in the transference to fertile types of winter wheat (Wisconsin Pedigree No. 2 and Marquis) of various characters proper to *Triticum timopheevi*, including resistance to mildew [*Erysiphe graminis*] and leaf and stem rusts [*Puccinia triticina* and *P. graminis*: *R.A.M.*, xx, p. 54].

Greaney (F. J.), Woodward (J. C.), & Whiteside (A. G. O.). **The effect of stem rust on the yield, quality, chemical composition, and milling and baking properties of Marquis Wheat.**—*Sci. Agric.*, xxii, 1, pp. 40–60, 1941.

Co-operative studies [the results of which are tabulated] carried out at Winnipeg from 1933 to 1937 to determine the effect of stem rust (*Puccinia graminis tritici*) on the yield [*R.A.M.*, xvi, p. 25], quality, chemical composition, and milling and baking qualities of Marquis wheat showed that in 1934, 1935, and 1937 (when the untreated plots became heavily infected and those dusted with sulphur developed a wide range of infection), stem rust alone or in conjunction with leaf rust (*P. triticina*) [ibid., xix, p. 204] markedly affected yield, kernel weight, and commercial grade. In 1937, when leaf rust was not a complicating factor, increase in stem rust from 5 to 90 per cent. reduced the yield by 84 per cent. and the kernel weight by 65 per cent.; the test weight per bush. was reduced by 14 lb., and the commercial grade lowered from 'Manitoba No. 1 Hard' to 'Feed Wheat'. Grain yield and quality were always inversely proportional to the percentage of infection. 'Of the agronomic factors studied, kernel weight afforded the most accurate index of the extent of stem rust injury.

In each of the same three years the protein content of the grain decreased as the percentage of rust increased, stem rust exerting a marked effect. The phosphorus, calcium, and ash contents of the grain were not significantly affected by rust in 1934 and 1935, but in 1937, all three constituents increased with increased stem rust. On the other hand, it was found that the protein and phosphorus contents of the straw increased, though the calcium and ash contents decreased, with increased stem rust. Increase in stem rust was always associated with a decrease in yield of straight grade flour, loaf volume, and in crumb colour and crumb texture score. The content of yellow pigment (carotene) of the flour increased with increased rust. In all three years, stem rust reduced the milling value of the wheat.

Russell (R. C.) & Ledingham (R. J.). **Wheat seed testing from the pathological standpoint with special reference to embryo exposure.**—*Sci. Agric.*, xxi, 12, pp. 761–775, 1 fig., 2 graphs, 1941.

A full account is given of routine tests made of over 200 samples of seed wheat produced in Saskatchewan to ascertain their suitability for seed purposes. The tests were as follows: (1) visual examination, (2) examination for exposed embryos, (3) centrifuge test, and (4) incubation test. In the first, each sample was examined with respect to colour, plumpness, and indications of disease. In the second, a portion of each sample was placed in a glass tube of small bore, and examined microscopically for cracks or breaks in the pericarp and testa over the embryo. In the third, a portion of each sample (40 gm.) was placed in a flask with 60 c.c. of water and shaken for four minutes, the water decanted, and four 12 c.c. portions centrifuged for four minutes. The supernatant water was again poured off and the remaining water (about ½ c.c.) and sediment examined under the microscope for bunt [*Tilletia foetida* and *T. caries*] spores. In the fourth test, 100 kernels of each sample, previously untreated, were incubated at 24·5° C. for four days, after which the number and kinds of fungal colonies found were recorded. Some of the samples were examined still further in germination tests in pots in the greenhouse, and in germination, yield, and bunt tests in the field.

The results obtained were as follows. The centrifuge test revealed very little apart from the presence of bunt spores on about one-third of the samples. When some of these samples were sown in the field it was found that a trace of bunt spores on the seed sometimes resulted in a trace of bunt in the mature crop, and in about an equal number of cases did not. More numerous bunt spores on the seed gave heavier infections in the mature crop. Under Saskatchewan conditions, seed treatment against bunt should be carried out whenever the seed shows a trace of the spores, but not unless. About two-thirds of all the seed samples tested showed no trace of bunt, and only very few revealed any appreciable infection by *Helminthosporium sativum*.

The incubation test showed that a large proportion of the seed carried *Alternaria* spp. and other fungi, including *H. sativum*, *Fusarium* spp., *Rhizopus nigricans*, *Cladosporium* sp., and *Penicillium* spp.

Critical examination for cracks and holes in the seed coat showed that about 25 per cent. of all the kernels examined had their embryos

more or less completely exposed to the action of fungi and fungicides. Emergence of a sample was generally reduced when a large proportion of the seeds had the embryos exposed, such reduction being due to mechanical destruction of parts of the embryos, direct poisoning by the unobstructed penetration of fungicides, parasitic attack on the developing seedling, or the presence of saprophytes on the endosperm. Both greenhouse and field tests showed that formalin treatment is particularly apt to damage seeds with exposed embryos, whereas ceresan had a beneficial effect in greenhouse tests but caused slight or no consistent improvement in field tests. Reduced emergence was not invariably followed by reduced yield. In some cases the thinner stand was able to utilize all the available moisture and produce as much grain as the thicker stand. In other instances, however, reduced emergence resulted in distinctly smaller yields, and this would probably apply to weedy fields. Where much embryo exposure is present the rate of seeding should probably be increased.

Sandu-Ville (C.) & Hulpoi (Aurelia). **Resistența câtorva soiuri de Grâu la infecțiunea cu mălură.** [The resistance of some Wheat varieties to infection with bunt.]—*Viața agric.*, xxxi, 2, pp. 37–40, 1940.

A tabulated account is given of the writers' experiments in 1938–9 at the Agricultural Research Institute, Bucharest, to determine the reaction of 16 wheat varieties to artificial infection with the spores (1 to 5 gm. per kg. seed-grain) of *Tilletia foetens* [*T. foetida*], which is stated to be both more widespread and more virulent under local conditions than *T. tritici* [*T. caries*: *R.A.M.*, xviii, p. 732]. The most resistant variety was found to be Odvoș 241 (average infection 12·99 per cent.), followed by pure line Tighina 265, Hamangia 2–123, Roșu românesc, Bălan, Zemka, and I.C.A.R. 14, with 19·69, 19·70, 21·68, 22·93, 23·26, and 24·77 per cent., respectively, and the most susceptible American 26 (59·67 per cent.).

Szirmai (J.). **Vergleichende Freilandbeizversuche mit Kupfervitriol und Kupferkalkbrühe gegen Weizensteinbrand.** [Comparative field disinfection experiments with copper sulphate and Bordeaux mixture against Wheat bunt.]—*Rep. Hung. agric. Exp. Sta.*, xliii, 1–6, pp. 43–49, 3 figs., 1941. [Hungarian, with German summary.]

In continuation of a previous series of laboratory experiments (*Rep. Hung. agric. Exp. Sta.*, xlii, pp. 1–12, 1939), the writer compared the efficacy of copper sulphate and Bordeaux mixture in 1 and 2 per cent. solutions in the control of wheat bunt [*Tilletia caries* and *T. foetida*: *R.A.M.*, xv, pp. 144, 351], seed-grain of the Bánkuli 1201 variety being immersed in the fungicides for periods of 15 to 30 minutes. Copper sulphate caused a retardation of germination ranging from 48·5 to 61·5 per cent. (or more under adverse conditions), the extent of the injury still amounting to between 4·5 and 25 per cent. in the fifth week. No such ill effects followed the treatment with Bordeaux mixture, which in some cases actually stimulated germination. Bordeaux mixture further proved superior to copper sulphate in promoting resistance to winter injury, density of stand, vigorous growth, and prolific yields, the surplus grain and straw due to the former as

compared with the latter preparation amounting to 13·2 and 16·3 per cent., respectively. The plants developing from the disinfected seed-grain did not suffer from bunt, which occurred in the dry and wet controls to the extent of 8·3 and 5·2 per cent., respectively.

Ministry of Agriculture and Fisheries. Advisory Leaflets.—London, H.M. Stationery Office. 1d. each.

In leaflet 304, 3 pp., 1941, a popular description is given of the symptoms and etiology of take-all or whiteheads of wheat and barley (*Ophiobolus graminis*), with directions for its control by crop rotation, barley and wheat being excluded in favour of roots or some other non-susceptible crop for a reasonable period; cultural measures designed to reduce the virulence of the fungus, including (especially on the light-textured soils favouring its development) early ploughing, bastard-fallowing or the interposition of a mustard catch crop, and thorough consolidation of the seed-bed before drilling, which should preferably be deferred until October or November to allow the early autumn rains to contribute to this process; liberal applications of phosphates and nitrogen in the form of sulphate of ammonia, avoiding overdoses of lime; extermination of grass weeds, such as couch [*Agropyron repens*] and slender foxtail [*Alopecurus agrestis*], both frequent carriers of infection; omission of rye grass [*Lolium perenne*] from the temporary ley where the disease has been troublesome, clover alone being sown instead to starve out the pathogen, or in a mixture with timothy [*Phleum pratense*], on which infection is not ordinarily perpetuated; and cultivation of the red wheats, which withstand attacks of take-all better than the white ones.

Revised editions of the following leaflets appeared during 1941: Common scab of the Potato (No. 5), Downy mildew of the Onion (85), Apple and Pear canker (100), Dry rot of Potatoes (218), Spotted wilt of Tomato (238), Tomato leaf mould (263), and Potato leaf roll (278).

Grace (N. H.). **Effects of phytohormone, potassium nitrate, and ethyl mercuric bromide on the germination and early growth of Wheat.**—*Canad. J. Res.*, Sect. C, xix, 6, pp. 211–215, 1941.

The results are given of greenhouse experiments in which Marquis wheat seed-grain was treated with various talc dusts containing indoleacetic acid, potassium naphthylacetate, potassium nitrate, and ethyl mercuric bromide [*R.A.M.*, xix, p. 586]. The last-named retarded the germination rate but increased the final germination count; potassium nitrate interacted with ethyl mercuric bromide, and when used with it reduced final germination and the air-dry weight of young plants. The addition of phytohormone did not affect these results. Phytohormone alone did not markedly affect germination, but on the average dust treatments reduced the rate of germination but increased the air-dry weight of stems.

Tervet (I. W.). **The relative susceptibility of different lots of Oat varieties to smut.**—*Phytopathology*, xxxi, 7, pp. 672–673, 1941.

The percentage of infection developing in 11 lots of Anthony oats seed-grain from four localities in Minnesota as a result of inoculation with collection 96 of *Ustilago levis* [*U. kolleri*: *R.A.M.*, xx, p. 159]

ranged from 14 to 72, the former count applying to 1939, and the latter to 1936 material, both from the University Farm, St. Paul. While a full explanation of these differences in susceptibility has not yet been obtained it was found that rapidity of germination, involving a reduction in the infection period, increased resistance to *U. kolleri*, while light seed-grain, as already shown by Lods and Coulson in Canada [ibid., x, p. 179], gives rise to more susceptible seedlings than larger seed. Results similar to the foregoing were obtained with seed lots of the Rusota, Iogold, and Gopher varieties, while a parallel series of tests with collection 27 of *U. avenae* [loc. cit.] also developed along comparable lines, though the incidence of infection in this case was lower than with *U. kolleri*.

Ling (L.). **Factors affecting infection in Rye smut and subsequent development of the fungus in the host.**—*Phytopathology*, xxxi, 7, pp. 617–633, 2 figs., 2 graphs, 1941.

Continuing his studies at the Minnesota Agricultural Experiment Station on the factors affecting the infection of rye by *Urocystis occulta* and the subsequent development of the smut within the host [*R.A.M.*, xvi, p. 666; xx, p. 297], the writer found that the maximum incidence of attack on the Dakold variety occurred when the inoculated seeds were germinated in soil with a hydrogen-ion concentration of P_H 7·36. The progress of the fungus was expedited by the maintenance of the soil in a relatively dry state (25 per cent. of the water-holding capacity), under which condition the percentages of Rosen plants infected in two experiments were 35 and 26, respectively, compared with 29 and 24, respectively, at 50 per cent. water-holding capacity, and 14 and 19, respectively, at 75 per cent.

In field tests on a poor, sandy soil, the amount of smut was not influenced by the fertilizer scheme, but in sand cultures in the greenhouse solutions with high potassium phosphate and low calcium nitrate and magnesium sulphate contents tended to reduce the amount of smut, while a reversal of these ratios induced the opposite effect. Variations in the intensity of light and the duration of exposure did not significantly affect the incidence of smut in the Prolific (spring) variety, but an extension of daylight from the normal 9 to 11 to between 17 and 18½ hours increased the percentage of infection in the winter Dakold from 39 to 48 per cent., the corresponding amount for the short-day (6 to 8 hours) series being 29 per cent. Smutted plants of Dakold were observed in the field to suffer more severely from winter-killing than healthy ones following the rigorous conditions of 1935–6. At a low temperature (15° C.), precocious germination favoured the infection of Dakold rye by *U. occulta*, the incidence of which in seedlings all emerging within two days of the appearance of the first was 46 per cent. as against 37 per cent., in those coming up slowly and 39 per cent. in unselected seedlings used as a control. Similar relations obtained in a comparative test with Ceres wheat inoculated with *Tilletia levis* [*T. foetida*] (from Mexico) at 10°, the infection percentages in the early, late, and control groups being 61, 39, and 56, respectively [ibid., iv, p. 339]. At higher temperatures, however, rapidity of germination was not a controlling factor in smut or bunt development.

Picric acid, applied to the soil at the rate of 240 mg. per kg., reduced the incidence of *U. occulta* in Dakold rye from 37 to 20 per cent. [ibid., xix, p. 139], but caused the formation of necrotic spots on the leaves and withering of their tips.

Reyes (G. M.). **Notes on diseases affecting Maize in the Philippines.**—*Philipp. J. Agric.*, xii, 1, pp. 61–69, 6 pl., 1941.

In these notes on maize diseases in the Philippine Islands the author states that downy mildew (*Sclerospora philippinensis*) [*R.A.M.*, xviii, p. 444] occasionally causes 100 per cent. infection in some parts. Selection work for resistance is in progress, and of six selections planted, one remained unaffected, while the others showed only 2·7 to 5·4 per cent. infection, as against 7·5 (Cebu White) to 31·5 (Bauan Pula) per cent. for commercial varieties in the vicinity. In the wet season, the plantings made from 15th to 28th May are those least affected, while preliminary observations indicate that plantings made in October and coinciding with the drier months remain unaffected even in the presence of abundant sources of infection.

During 1939–40, the crop was affected by four diseases not previously reported from the Philippines, viz., brown spot (*Physoderma zeae-maydis*) [*P. maydis*: ibid., xiii, p. 691], suspected of being present unnoticed for some time, attracting attention in 1940 by its prevalence and severity; anthracnose due to an unidentified species of *Colletotrichum*; dry ear rot, stated to be quite common and possibly caused by *Diplodia frumenti* [ibid., xvii, p. 670]; and a disease resembling sugarcane pokkah-boeng, produced by a fungus agreeing essentially with *Fusarium moniliforme* [*Gibberella fujikuroi*]. The last-named disease has been observed occasionally but no record of its occurrence has hitherto been published. When warm, humid weather prevails, maize is occasionally attacked by banded sclerotial disease (*Rhizoctonia* [*Corticium solani*]) [ibid., xviii, p. 626; xx, p. 357], which appears to be of minor importance.

Ramakrishnan (T. S.) & Narasimhalu (I. L.). **The occurrence of Darluca filum (Biv.) Cast. on cereal rusts in South India.**—*Curr. Sci.*, x, 6, pp. 290–291, 2 figs., 1941.

Specimens of sorghum, *Pennisetum typhoides*, and *Setaria italica* infected by *Puccinia purpurea* [*R.A.M.*, xix, p. 331], *P. penniseti* [ibid., vii, pp. 13, 231, 712], and *Uromyces setariae-italicae* [ibid., xv, p. 635], respectively, which were collected in the period from November to January during the last few years at the Coimbatore Agricultural College, frequently bore uredosori parasitized by *Darluca filum* [ibid., xx, p. 395]. The hyperparasite, of which this is stated to be the first record on cereal rusts in India, usually develops only in the later stages of infection, during or following rainy weather, so that its utility in the practical control of the diseases under observation is doubtful.

Morris (H. I.), Klotz (L. J.), & Sokoloff (V. P.). **Brown rot control and copper injury. Report of a field experiment on Lemons.**—*Calif. Citrogr.*, xxvi, 10, p. 284, 1 fig., 1941.

In a fungicide trial in a Californian orchard in 1941, lemon trees

averaging 27 years of age sprayed 'to a four-foot skirt of the trees' with 6–6–100 Bordeaux mixture at the rate of 6·7 gals. per tree, the same at 3·6 gals., and with 1–1–100 Bordeaux mixture at the rates of 6 and 4 gals. per tree showed a reduction in the number of fruits affected by brown rot [*Phytophthora citrophthora*, *P. parasitica*, *P. hibernalis*, and other species: *R.A.M.*, xx, p. 299] from a total of 126·8 per tree for the controls to 12·6, 12·5, 22·2, and 47·1, respectively. In three other plots, which had fewer lemons near the ground within the splashing range of the brown rot zoospores, applications of a commercial 5–1–4–100 zinc-copper-lime mixture at rates of 6 and 3·7 gals. per tree and 2–2–100 Bordeaux mixture at the rate of 4 gals. per tree yielded averages of 19·0, 21·4, and 14·3 diseased fruits per tree, respectively. Heavy applications proved more successful than light ones, particularly with the weaker sprays, the 1–1–100 Bordeaux mixture giving apparently satisfactory commercial control under these conditions. The addition of zinc sulphate was observed to decrease the tendency of the trees to be injured by copper or by the combined effects of copper and fumigation. Long, continuous periods of rainy weather are held responsible for copper burns, as the accumulation of carbon dioxide on moist plant surfaces is said to favour the solution of copper to concentrations that are corrosive to the surface cells of the fruit. An examination of dried rinds of lemons indicated that the injuries to the rind surface are associated with the high copper content of the necrotic tissue derived presumably from the copper sprays.

Blackford (F. W.). **The establishment of a home-made cuprous oxide mixture as a Citrus fungicide in southern Queensland.**—*Qd agric. J.*, lvi, 1, pp. 4–33, 2 figs., 1 graph, 1941.

In comparative trials in southern Queensland, a short account of which has already been given elsewhere [*R.A.M.*, xx, p. 151], home-made cuprous oxide (prepared by adding to a solution of 1 lb. copper sulphate, 1 pt. molasses, or alternatively honey and 4 pts. water, one containing 5 oz. caustic soda in 3 pts. water), used at a strength of 3 gals. of the stock mixture to 40 gals. of water in the normal spraying schedule, proved as effective as Bordeaux mixture of the same copper content (i.e., 3–3–40) in controlling brown spot (*Glocosporium* sp.), black spot (*Phoma citricarpa*), melanose (*Diaporthe citri*), and scab (*Sphaceloma fawcettii scabiosa*) [ibid., xvi, p. 451] of citrus. Black spot and melanose were also effectively controlled in one season's experiments by the 3–80 strength of cuprous oxide, and this strength was of value in one experiment against brown spot, but further experiments are considered necessary before it can be generally recommended. Cuprous oxide did not seem to injure the trees in the manner typical of Bordeaux mixture. It was found to be compatible with various sprays used against citrus pests, provided honey was substituted for molasses in the presence of soap or white oil. It was possible to fumigate trees sprayed with cuprous oxide sooner after spraying without causing injury than those sprayed with Bordeaux mixture. This is believed to be due to the fact that the former spray is washed off the leaves by rain more rapidly than the latter. In accordance with these results and taking weather into consideration spray schedules against pests

and diseases of citrus are proposed for coastal and inland districts. The purely fungicidal spray schedules for southern Queensland are applications of the cuprous oxide mixture (3–40) in late September ($\frac{1}{2}$ to $\frac{3}{4}$ petal fall) against all four diseases, a second application in late November for brown and black spots, and a third in late February against brown spot.

Ruehle (G. D.) & Kuntz (W. A.). **Melanose of Citrus and its commercial control.**—*Bull. Fla agric. Exp. Sta.* 349, 54 pp., 7 figs., 1940.

In spraying experiments conducted in commercial grape-fruit and orange orchards in central Florida during the years 1932 to 1937, a single application of 6–6 (hydrated lime)–100 Bordeaux mixture gave consistent control of melanose (*Diaporthe citri*) [*R.A.M.*, xx, p. 58]. A single application of a 3–3–100 mixture was sometimes equal to the stronger spray, but under conditions of severe infection decidedly inferior; two applications of the 3–3–100 spray, with an interval of three to four weeks between them, gave better results than a single treatment with the 6–6–100 formula. Pre-growth spraying proved less effective than a correctly timed application after petal fall and is not recommended except in the presence of scab [*Elsinoe fawcetti*]. Pruning alone is not considered sufficient for the control of melanose, but it is advised as a regular practice in early or mid-spring in addition to spraying. Of a number of proprietary copper sprays tested, red cuprous oxide (containing 85 per cent. metallic copper) and tribasic copper sulphate compared favourably with the 3–3–100 Bordeaux spray, but were less effective than the 6–6–100 one. Insecticides compatible with Bordeaux mixtures can also be combined with these insoluble copper materials. Wettable or bentonite sulphurs (5 to 10 lb. per 100 gals.) proved to be the most practical spreaders to use for insecticidal purposes with post-bloom copper sprays, and did not reduce their fungicidal efficiency. A form of spray injury often mistaken for true melanose and known as stellate melanose is stated to be favoured by the use of oil emulsion with or closely following copper sprays. This injury gives rise to larger and more conspicuous spots than those of true melanose, which are formed more frequently on the leaves than on fruits; the injury is rarely abundant enough to cause appreciable damage. To avoid all kinds of spray injury, no sprays should be applied to wilted trees or those beginning to flush vigorously; oil or lime-sulphur sprays should not be applied at temperatures above 90° F.; and an interval of at least three weeks should be allowed to elapse between applications of lime-sulphur and either copper or oil. Spraying schedules based on these results are given for the control of various pests and melanose and scab of oranges, grapefruit, and tangelos.

The premature fall of Coconuts.—*Trop. Agriculturist*, xcvi, 5, pp. 253–254, 1 graph, 1941.

In this note on the so far unexplained premature shedding of coconuts in Ceylon a graph is given which shows no relation between nut fall and rainfall. No causal organism has yet been isolated, and the condition has failed to respond significantly to every form of treatment tried.

Wallace (G. B.). **Report of Plant Pathologist.**—*Rep. Coffee Res. Exp. Sta., Lyamungu, Moshi, 1940* (*Pamph. Dep. Agric. Tanganyika* 28), pp. 15–17, 1941.

In this report [cf. *R.A.M.*, xix, p. 591] the author states that the control of coffee yellowing and leaf fall by spraying with Bordeaux mixture has been found necessary on the ash soils of Ngare-Ol-Motoni and Monduli in the Arusha District of Tanganyika. In other areas (except at the higher altitudes) *Hemileia* [*vastatrix*] is present, and the coffee on plantations owned by Europeans is being sprayed with Bordeaux mixture, so that the problem of the type of leaf fall referred to will not arise. In an experiment begun in 1940 to ascertain the minimum amount of spraying necessary to control the leaf fall, single applications in February and double applications in February and June all demonstrated that the sprayed trees retained their leaves from May to August, while the unsprayed trees were badly affected. The results given by 0·25 per cent. Bordeaux mixture were sufficiently satisfactory to justify its trial by growers. A spray solution prepared from 'perenox dispersable powder', a cuprous oxide fungicide [ibid., xix, p. 674] made by Imperial Chemical Industries, London, and used at the rate of 0·55 lb. per 32 gals., i.e., at equivalent cost and two-thirds the copper content of 0·5 per cent. Bordeaux mixture, was as effective as any other treatment tested, with the additional advantage of small bulk and ready solubility. Owing to failure of the November rains at Ngare-Olco-Motoni in 1940, flowering suffered severely. On 12th December it was found that only 3 of 64 untreated trees had flowered, 19 of 64 dusted trees, 20 to 48 (average 34) of 64 trees treated with Bordeaux mixture of different strengths, and 31 of 64 perenox-sprayed trees.

In an experiment involving neither stripping nor mulching of the guard-rows, the trees developed severe sun scorch, i.e., one side of the cherries, generally the upper and western one, showed pulp which was blackened, flat, and shrunken on to the parchment within. Trees moderately stripped were unaffected. Apparently predisposition is more conducive to the condition than exposure; in this case, the principal predisposing cause was weakness due to over-bearing. Yellowing of the foliage, leaf fall, and twig die-back were associated with the condition.

Tea scab (*Elsinoe theae*) [ibid., xix, pp. 329, 369] was confirmed on material from the Usambara mountains, where it is now very prevalent on older leaves. It was first recorded in Tanganyika in 1930.

Ling (L.) & Yang (Juhwa Y.). **Stem blight of Cotton caused by Alternaria macrospora.**—*Phytopathology*, xxxi, 7, pp. 664–671, 2 figs., 2 graphs, 1941.

A stem blight, locally known as 'dry scar', of cotton is stated to be widespread and responsible for heavy losses, especially among varieties of Asiatic cotton (*Gossypium arboreum*) in Szechwan Province, China. The pathogen, which is believed to be a strain of *Alternaria macrospora* [*R.A.M.*, xvii, p. 674; xx, p. 461], produces on the stems, twigs, and leaf petioles of mature plants dark brown, roughly circular spots, gradually turning dark grey and assuming an elliptical or oval shape,

the centres at the same time becoming deeply sunken and forming cankers. Diseased tissues usually split longitudinally or crack into fragments, and finally the infected stem or twig breaks off at the canker, causing the death of part or all of the plant. From the upper part of the petiole, the lesion may extend upwards into the midrib and veins near the leaf base.

The pathogen was isolated in pure culture on potato dextrose agar, on which it throve at a temperature range of 16° to 36° C., with an optimum at 28°. Growth took place over a wide range of hydrogen-ion concentrations with maxima at P_H 4·2 and at 7·6. The fungus is characterized by brown, septate, usually simple conidiophores, 21 to 124 by 4 to 10 μ, and brown, obclavate conidia, 40 to 288 by 8 to 29 μ, including the beak (from 15 to 216 μ long), and provided with 3 to 13 transverse and 3 to 5 longitudinal septa. *A. tenuis* was also isolated from diseased leaves only.

In inoculation experiments American cotton (*G. hirsutum*) proved equally susceptible with *G. arboreum* to stem blight in the early stages of growth, but gradually acquired some degree of resistance. Wounding increased the incidence of artificial infection on the stems from 70 to 100 per cent. On inoculated bolls the initial minute, greyish-brown spots frequently turn purplish and coalesce, while in a very humid atmosphere conidia develop in sufficient numbers to impart a black cast to the centre of the lesion. In the field the disease is most prevalent in July, just before flowering, serious outbreaks being promoted by successive periods of rainfall and high humidity, in combination with fairly high temperatures. In 1938, for instance, a year with a wet July, 30 per cent. infection was observed in one field, whereas in 1939 the abnormally dry weather arrested the spread of the organism, the damage due to which was almost negligible. *A. macrospora* was experimentally shown to overwinter on dead, infected stalks in the field, while the possibility of seed transmission is indicated by its frequent development from surface-sterilized cotton seeds cultured on agar plates.

Blank (L. M.) & Talley (P. J.). **The carbon utilization and carbohydrase activity of Phymatotrichum omnivorum.**—*Amer. J. Bot.*, xxviii, 7, pp. 564–569, 1941.

The growth of *Phymatotrichum omnivorum* [*R.A.M.*, xx, p. 403] on different types of carbohydrates was determined by quantitative measurements. The results varied according to whether sterilization was effected by autoclaving or by treatment with alcohol, but no adequate explanation was found for these differences. Glucose, fructose, and mannose proved to be the best carbon sources. The utilization of polysaccharides was found to be correlated with the ability of the fungus to hydrolyse them and the rates at which they were hydrolysed.

Couch (J. N.). **A new Uredinella from Ceylon.**—*Mycologia*, xxxiii, 4, pp. 405–410, 12 figs., 1941.

A new species of *Uredinella* [*R.A.M.*, xvii, p. 349], on material from Ceylon sent by Mr. T. Petch is described and named *U. spinulosa* Couch & Petch. It forms minute, circular, flat patches on leaves of

Psychotria, always overgrowing and parasitic on a scale insect (*Aspidiotus* sp.). The fungus has irregularly coiled haustoria composed of sausage-shaped segments. Penetration apparently occurs directly through the skins of the insects. It can be distinguished from *U. coccidiophaga* [loc. cit.] by its small size, occurrence on leaves, smooth or minutely warted, globose to subglobose teleutospores, and above all by its conspicuous spines. An abundant collection of *U. coccidiophaga* growing on scale insects on *Myrica cerifera* was received by the author from Dr. G. F. Weber, Florida, where this fungus forms patches from 1·6 to 3·8 mm. wide.

Charles (Vera K.). **A fungous disease of Codling Moth larvae.**—*Mycologia*, xxxiii, 4, pp. 344–349, 1 fig., 1941.

A fungus was isolated in culture from larvae of the codling moth (*Carpocapsa pomonella*) from an apple orchard in Virginia, where it had killed possibly 40 per cent. of the larvae, and from one collection in Indiana and one in Delaware. In the absence of a mature ascigerous stage, the fungus is referred to *Hirsutella subulata* although it differs from the type specimen described by Petch [*R.A.M.*, xi, p. 573] and based on an English form in showing occasional bifurcate clavae and bisterigmatous phialides. The measurements of the phialides, sterigmata, and conidia of the fungus (6 to 10 μ, 8 to 10 μ, and 2 to 2·5 by 5 to 6 μ, respectively) exceeded those given by Petch, but attention is drawn to the fact that the measurements of the conidia given by him for two North American specimens from the Farlow Herbarium also exceeded the measurements given in his diagnosis of the species.

Kobayasi (Y.). **The genus Cordyceps and its allies.**—*Sci. Rep. Tokyo Bunrika Daig.*, Sect. B, v, 84, pp. 53–260, 70 figs., 1941.

Of the 200-odd species previously included in the genus, the author recognizes 124 as good species of *Cordyceps*, and regards the remainder as synonyms or as to be suppressed or transferred to other genera. He further proposes 13 species and one variety as new. Of these 137 species, about half are known only from their type collections.

On ascus and ascospore characters, he recognizes three subgenera, *Ophiocordyceps* (Petch), *Eucordyceps*, and *Neocordyceps*; and again divides the first two into sections on the position of the perithecia relative to the stroma, i.e., whether superficial or immersed, and whether perpendicular or oblique to the surface. All the species accepted are fitted into one of the dichotomous keys given under each section; and all those of which material has been examined are fully described in Latin.

Two of the species are found on sclerotia of *Claviceps*, five on fruit bodies of *Elaphomyces*, five on spiders, and 125 on the adult bodies, larvae, nymphs, or pupae of various insects. The full details of host and geographical distribution are given under each species, and also set out in a long table. Wherever known the conidial states are named, different species being placed in *Isaria*, *Hirsutella*, *Hymenostilbe*, *Stilbella*, *Cephalosporium*, and *Sporotrichum*; a further two species produce their conidia in pycnidial cavities formed on the stromata.

The paper ends with the description of 36 Deuteromycetes found on insects in Japan, mostly by the author. Unlike the species of *Cordyceps*,

some of them occur on insects of widely differing relationships. Six new species of *Isaria* are described, and one each of *Hirsutella*, *Hymenostilbe*, *Polycephalomyces* (gen. nov.), *Stilbella*, and *Sporotrichum*.

Reis (J.). **Queratomicose aspergílica epizoótica em Pintos.** [Epizootic keratomycosis caused by *Aspergillus* among Chicks.]—*Arq. Inst. biol., S. Paulo*, xi, 48, pp. 437–450, 12 pl., 1940. [English summary.]

Nearly 100 out of 1,000 chicks at a poultry farm near São Paulo, Brazil, were found in October, 1939, to be suffering from a disease of the cornea of the eyes, attributable to infection by *Aspergillus fumigatus* [*R.A.M.*, xviii, p. 679]. The fungus was isolated in pure culture on Czapek's agar and inoculated, in the form of spore suspensions, into the scarified cornea with positive results, which were likewise obtained with a strain of *A. flavus* from pulmonary aspergillosis in a parrot. The clean sawdust used as litter was found to be the source of infection.

Conant (N. F.). **A statistical analysis of spore size in the genus Microsporum.**—*J. invest. Derm.*, iv, 4, pp. 265–278, 2 graphs, 1941.

Continuing his studies on the genus *Microsporon* at the Duke Hospital, Durham, North Carolina [*R.A.M.*, xvii, p. 174], the writer made statistical analyses of eight species, viz., *M. fulvum*, *M. gypseum*, *M. obesum*, *M. simiae*, *M. equinum*, *M. pseudolanosum* [previously spelt *pseudosolanosum* in error: loc. cit.], *M. aurantiacum*, and *M. canis*, of which only the two first- and the last-named, with mean spore lengths of 39·56, 44·96, and 73·71 μ, respectively, are regarded as actually entitled to differential rank, the same being accorded to *M. audouini*. The curves of *M. equinum*, *M. pseudolanosum*, and *M. aurantiacum* (61·79, 64·47, and 70·07 μ, respectively) overlapped not only each other, but also the curve of *M. canis*, while overlapping further occurs between *M. obesum*, and *M. simiae* (55 and 58·29 μ, respectively). In connexion with the taxonomy of the species variously referred to *M. fulvum* and *M. gypseum*, the latter name (Bodin, 1907) takes precedence of the former (Guiart & Grigorakis, 1928), so that the genus at present comprises three authentic species, namely, *M. audouini*, *M. gypseum*, and *M. canis*.

Reiss (F.). **Dermatophytosis of the hands and feet.**—*Urol. cutan. Rev.*, xlv, 5, pp. 328–337, 1941.

Following a brief review of the history of interdigital dermatophytosis in China, the writer analyses the results of cultural studies in 14 out of 71 microscopically positive cases treated in 1939–40 as follows: *Trichophyton gypseum* and *Epidermophyton* [*T.*] *rubrum* one each, *E. inguinale* [*E. floccosum*] four, and *E.* [*T.*] *interdigitale* eight, the total number of cases of fungal infection of the hands and feet investigated during the period under review being 547. Symptoms and other features of the diseases are fully discussed.

Studt (Betty). **Morphological and physiological studies of a strain of Candida albicans associated with vaginitis.**—*Amer. J. Bot.*, xxviii, 7, pp. 509–516, 1 fig., 1941.

A yeast-like fungus, isolated in 1938 from the vaginal discharge of

a pregnant woman, was identified as *Candida albicans* [cf. *R.A.M.*, xvi, pp. 99, 177]. It was causing a seropurulent discharge associated with the development of white patches on the walls of the vagina. The author accepts the name *Candida* in preference to *Monilia* for the yeast-like fungus parasitic on animals, and considers that the former will no doubt be validated by the next International [Botanical] Congress.

On Sabouraud's glucose agar the fungus produced a smooth, glossy, cream-coloured growth of pasty consistency; about 48 hours after inoculation a much branched mycelium was formed around and beneath the pasty mass, growing down into the agar. Yeast-like oval spores, 3·5 to 7 by 3 to 4·5 μ, reproduced by unipolar (rarely bipolar) budding, compose the bulk of the central mass. On the mycelium spores arise at the septa and bud off chains of spores which continue to bud, producing branched compound verticils, and eventually forming compact masses which completely obscure the mycelium. Apart from these thin-walled blastospores round, thick-walled chlamydospores (gemmae of Shrewsbury) [ibid., xiii, p. 635], 6 to 10 μ in diameter, are formed. These stain deeply with iodine and with orseillin BB and may thus be distinguished from the lighter-staining blastospores. They are borne singly or in chains of two, terminally or on short lateral branches. The strain is considered quite stable, as its biochemical reactions remained constant over a period of two years. In glucose, levulose, and maltose both gas and acid were formed; in sucrose, dextrin, and inulin, acid accumulated, while neither acid nor gas was formed in lactose. Under certain nutritive conditions both acid and gas were formed in galactose, but with a peptone base, only acid was produced. It was found that the nitrogen, rather than the carbon source is the limiting factor in the growth of the fungus in the laboratory. When organic nitrogen in the form of bacto peptone was supplied to the cultural media, no carbohydrate was necessary for normal and abundant growth of the colonies.

Baker (E. E.) & Mrak (E. M.). **Spherule formation in culture by Coccidioides immitis Rixford and Gilchrist, 1896.**—*Amer. J. trop. Med.*, xxi, 4, pp. 589–595, 1 pl., 1941.

In the writers' studies at Stanford University School of Medicine, San Francisco, and the University of California, Berkeley, spherical or oval, terminal or intercalary spherules, 10 to 20 μ in diameter, were formed by certain strains of *Coccidioides immitis* [*R.A.M.*, xvii, p. 820] of human and animal origin on Sabouraud's glucose and potato dextrose agars and a synthetic medium containing 0·05 per cent. copper sulphate, the withdrawal of which appeared adversely to affect the production of the bodies in question, whereas the influence of other nutrients was indeterminate. The spherules developed both at room temperature and at 37° C., usually after an incubation period of six to eight weeks, and only on solid or semi-solid substrata. The capsulate walls of the spherules do not react to any of the common stains. Irregular or spherical endospores develop through the formation of successive cleavage planes in the spherules, the only difference between which and those formed in the host tissues is the larger size of the latter (20 to 40 or up to 80 μ).

Parsons (R. J.). **Transformation of the mycelial form of Histoplasma capsulatum, Darling, to the yeastlike form in mice.**—*Arch. Path. Lab. Med.*, xxix, 5, p. 731, 1940.

Cultures on a tartaric acid-agar medium at room temperature of the yeast-like bodies isolated from a nasal septal ulcer in a female patient at Ann Arbor, Michigan, developed into the mycelium of *Histoplasma capsulatum* [*R.A.M.*, xx, p. 405]. The yeast-like form of the fungus being solely responsible for progressive infection in man and animals, the author wished to convert the mycelial into the yeast-like phase, and this object was successfully accomplished by the intravenous injection of the mycelial form into young mice, autopsies on which revealed extensive parasitization of the macrophage system by the yeast-like elements of *H. capsulatum*.

Wright (R. B.) & Hachtel (F. W.). **Histoplasmosis of Darling; report of a case.**—*Ann. intern. Med.*, N.S., xv, 2, pp. 309–319, 4 figs., 1941.

The mycelial form of *Histoplasma capsulatum* obtained from blood cultures of the authors' patient, a 59-year-old diabetic barman, at the Maryland School of Medicine, Baltimore, was injected subcutaneously into a Rhesus monkey, the resultant abscess giving rise on blood agar at 37° C. to the yeast-like phase of the fungus [see preceding abstract]. A second monkey into which the latter form of the pathogen was injected became ill but subsequently recovered, and the organism could not be demonstrated at autopsy several months later, though blood cultures made while the disease was in progress yielded *H. capsulatum*.

Reeves (D. L.), Butt (E. M.), & Hammack (R. W.). **Torula infection of the lungs and central nervous system: report of six cases with three autopsies.**—*Arch. intern. Med.*, lxviii, 1, pp. 57–79, 8 figs., 1941.

This is a detailed account of the clinical and histological features of six cases of torulosis of the pulmonary and central nervous systems, encountered in the authors' Californian hospital practice, five in men (all fatal) and one in a 15-year-old girl still living 2½ years after the onset of the disease. The causal organism, *Torula histolytica* [*Debaryomyces neoformans*: *R.A.M.*, xx, p. 532], was isolated in pure culture in each instance, inoculated into monkeys, and the diagnoses confirmed by J. F. Kessel, of the mycological department of the Los Angeles County Hospital.

Almeida (F.) & Simões Barbosa (F. A.). **Contribuição para o estudo de 'Cephalosporium recifei'.** [A contribution to the study of *Cephalosporium recifei*.]—*Arq. Inst. biol., S. Paulo*, xi, 1, pp. 1–4, 2 pl., 1940. [English summary.]

Of the various media used in the authors' cultural study of *Cephalosporium recifei*, the causal organism of a mycetoma of the foot in a 34-year-old male Brazilian at Pernambuco, originally isolated in 1934 by Arêa Leão and Lobo [*R.A.M.*, xiv, p. 170], Czapek's agar proved to be the best adapted to the production of the characteristic colonies of the fungus, with a lemon-yellow central zone surrounding a raised,

cream-coloured button, and a downy, white periphery, with a bright pink transitional zone. The simple, hyaline, straight conidiophores measure 20 to 30 μ in length, and the smooth, hyaline, crescent-shaped conidia 5 to 6 by 0·5 to 1 μ.

Ramos (M. M.). **Dry-sheath-rot of Abacá caused by Marasmius and suggestions for its control.**—*Philipp. J. Agric.*, xii, 1, pp. 31–41, 3 pl., 1941.

Since 1936, different varieties of abacá [*Musa textilis*] in the Cavite, Mindoro, Bicol, and Davao areas of the Philippine Islands have been sporadically attacked, generally after a long period of drought, by a species of *Marasmius* referred to *M. semiustus* [*M. stenophyllus*: *R.A.M.*, xv, p. 778; xx, p. 7]. The fungus first exists as a soil saprophyte, but later attacks the corms, and penetrates the other living tissues of the plant. Under conditions of high temperature and moisture, it becomes an aggressive parasite, destroying numerous roots and attacking the developing buds and suckers. The affected part of the stem develops a dark brown, water-soaked appearance. The outer leaves dry up more rapidly than they are replaced. The amount of foliage is much reduced, and the affected plant is pale and stunted, and usually dies prematurely.

Inoculations were made at different times of the year on two- to five-months-old abacá seedlings of five different varieties by the insertion of portions of cultures between the outermost leaf sheaths, and by placing inoculum on the base of the plant just above soil-level. Most of the inoculated plants showed infection after five days. Of 23 inoculated Maguindanao plants, 11 died after three months, the corresponding figure for Baluñganon being 3 out of 6 and for Tañgoñgon, 3 out of 23.

Field observations showed that even if infected plants survived to the fruiting stage, they were economically valueless. Fungal growth and spread were found to be favoured by improper cultural practices and prolonged warm, moist weather. Infection generally occurs on humid days in poorly aerated, neglected plantations.

The fungus is characterized by a white, later dark pileus 5 to 15 mm. in diameter, convex when young, flat or almost concave at maturity, and white, hyaline, ovate spores measuring 3·6 to 10·8 by 3·6 to 9 (average almost 7·2 by 5·4) μ.

Control measures suggested include sanitation, roguing, proper distancing, and the planting of rootstocks from disease-free fields.

Neergaard (P.). **Nye eller upaaagtede Prydplantssygdomme i Danmark. 9–12.** [New or unobserved diseases of ornamental plants in Denmark. 9–12.]—Reprinted from *Gartnertidende, 1940*, 4 pp., 5 figs., 1940.

The writer describes the symptoms and recommends measures for the control of some new or hitherto unobserved diseases of ornamentals in Denmark [cf. *R.A.M.*, xviii, p. 596]. In addition to those listed in the report of the Ohlsen seed-testing laboratory, Copenhagen, for 1939–40 [ibid., xx, p. 526], mention may be made of Hollandia Wedgwood iris mosaic [ibid., xviii, p. 572] and purple spot of rose (*Sphaceloma rosarum*) [ibid., xviii, p. 112].

DEACON (G. E.). **A fungus disease of some species of Rosa.**—*Rose Annu., 1941*, pp. 113–115, 2 pl., 1941.

Didymella sepincoliformis, considered to be the agent of a sudden wilting and death of young lateral and terminal shoots of various species of rose in England, including *Rosa willmottiae*, *R. ecae*, *R. canina*, and *R. arvensis*, is characterized by flattened, globular perithecia, with thick, black, pseudoparenchymatous walls and a small, circular ostiole, giving rise to a fascicle of cylindrical or subfusoid, aparaphysate asci, containing eight fusoid or ovoid, uniseptate, uni- to triguttulate, hyaline ascospores, 17 to 19 by 6 to 8 μ. Mature perithecia are produced in greatest abundance in March and April, but the organs are present in various stages of development in every month of the year. Spore discharge begins at the end of March and wilting takes place at the end of May, shortly after which brown pycnidia, containing globular to oblong, continuous, hyaline spores, 7 to 8 by 7 μ, appear on the bark of the diseased shoots. The perithecia usually begin to develop in September on twigs contracting infection the previous May, and by the latter part of October they are visible in large numbers as black dots in the bark, surrounded by a white halo of raised cuticle. The onset of colder weather tends to postpone further growth until February. The disease is very persistent, and in all the bushes under observation has recurred regularly for the last five years. Attempts to isolate the pathogen in pure culture and artificial inoculation experiments were unsuccessful.

HOPKINS (J. C. F.). **Diseases of fruit, flowers, and vegetables in Southern Rhodesia. 3. Common diseases of Snapdragon.**—*Rhod. agric. J.*, xxxviii, 8, pp. 441–447, 2 pl., 1941.

In these notes on the symptoms, causes, and control of *Antirrhinum* [*majus*] diseases in Southern Rhodesia, the author states that damping-off is caused locally by *Pythium de Baryanum*, *Rhizoctonia* [*Corticium*] *solani*, and *Phytophthora parasitica*. The disease is very prevalent during the warm, rainy months of December, January, and February, and is especially troublesome on seedlings raised under thatch to protect them from rain. For control purposes, seedlings should not be raised under low shade, and the surface of the soil should be dusted with Bordeaux powder after the seed has been sown and covered up.

The most frequent cause of foot rot [*R.A.M.*, xiv, p. 678] is *P. parasitica*, which is almost always followed by *C. solani*. Infection generally occurs at transplanting time, if the plants are allowed to wilt before becoming fully established; young plants may be killed at this stage. The disease may also occur on plants over a year old. Infection may be prevented by avoiding excessive soil humidity, shading the young plant at transplanting with a mulberry leaf, and sprinkling a teaspoonful of Bordeaux powder round each plant at setting out. The disease may also be prevented by three applications to the bed at weekly intervals of Cheshunt compound.

Rust (*Puccinia antirrhini*) [cf. ibid., xx, p. 150] has only recently appeared in Southern Rhodesia, but it seems already to have become widely prevalent. It was first reported from Bulawayo district in October, 1940, where it was then well established. More recently, it

has been reported on several occasions from Mashonaland. It is likely to prove more serious in the cool winter months than in summer. All young diseased plantings examined in June and July, 1941, showed a very high degree of infection, whereas older plantings, which made most of their growth during summer, were less seriously affected, only about 50 per cent. of the plants being badly attacked. The main factor in control is the removal and destruction by burning of all infected plants before new sowings are made. Antirrhinums should not be grown successively in the same ground. Until satisfactory resistant strains are available, fungicidal treatment should be adopted, using Bordeaux mixture (8 lb. ready-mixed powder per 40 gals. water, plus 1 oz. lethalate or 5 oz. casein spreader), bouisol (1 pint per 10 gals. water plus 4 oz. household soap), dusting sulphur, or colloidal sulphur (8 fluid oz. per 10 gals. water plus 4 oz. soap). Treatment should begin when the plants are about 2 in. high, and should be repeated twice before the flowers open.

The only troublesome form of leaf spot found locally is that due to *Phyllosticta antirrhini* [ibid., vii, p. 723], which is most prevalent in the rainy season, but is favoured by overhead watering during dry weather.

Blodgett (C. O.) & Mehlquist (G. A. L.). **Snapdragon rust-resistance trials.**—*Hilgardia*, xiii, 10, pp. 569–581, 1941.

A tabulated account is given of the data secured in trials conducted in California in 1937–8 in connexion with an attempt to discover species, varieties, or strains of *Antirrhinum* immune from, or at least highly resistant to, the new, as well as to the original, physiologic races of *Puccinia antirrhini* [*R.A.M.*, xvi, p. 387]. Seed for the experiments was obtained from Belgium, Rumania, Germany, Sweden, Italy, France, England, Turkey, and the Lompoc district of California. None of the commercial varieties tested in more than one locality proved to be immune from the rust, though several, including 3R and 4R from Michigan, were highly resistant, as were also *A. asarina*, *A. chrysothales*, *A. glandulosum*, *A. maurandioides*, *A. orontium*, *A. ibanjezii*, and *A. siculum* [cf. ibid., xv, p. 227], though the distance of the taxonomic relationship of these species to *A. majus* casts some doubt on their utility in a plant-breeding programme.

The low humidities and high temperatures prevailing in the Sacramento Valley in 1937 were apparently not conducive to the development of *P. antirrhini*, which did not assume an aggressive form until the onset of cooler conditions after mid-September, too late to interfere significantly with seed production. Wind was observed to aid the dissemination of the rust to a very appreciable extent, the incidence of infection being uniformly heavier on the leeward than on the windward side. The second physiologic race of *P. antirrhini* appears for the moment to be confined to the coastal regions of Salinas, Guadelupe, and Lompoc, where it did not develop until three years after the introduction of resistant varieties. The outbreak of rust at Lompoc in 1936 was so severe that seed crops were seriously damaged, whereas at Guadelupe in the same year infection was very light. In the succeeding year the incidence of rust infection was completely reversed.

This behaviour is inexplicable, but factors other than hereditary ones evidently play a role in determining relative severity of rust infection.

Pape (H.). **Triebsterben bei Phlox. Ein Pilz der Erreger.** [Death of Phlox shoots. A fungus the agent.]—*Blumen- u. PflBau ver. Gartenwelt*, xliv, 32, pp. 282–283, 1940. [German. Abs. in *Biol. Abstr.*, xv, 7, p. 1431, 1941.]

Of recent years perennial phlox (*Phlox decussata*) in Central Europe has suffered from a disease characterized by more or less extensive cankers on various levels of the stem, eventuating in wilting and death of the shoots. A description is given of the causal organism, *Phoma phlogis*, from which some phlox varieties were apparently immune in the midst of others that had contracted infection. A similar disease of the same host in France is attributed to *Diplodina phlogis*.

Dimock (A. W.). **Rhizoctonia foot rot of Stocks can be controlled.**—*Flor. Rev.*, lxxxvii, 2244, pp. 13-14, 3 figs., 1940. [Abs. in *Exp. Sta. Rec.*, lxxxv, 2, p. 216, 1941.]

Stocks [*Matthiola incana*] at Cornell University, New York, were experimentally shown to be susceptible to the destructive disease caused by *Rhizoctonia* [*Corticium* (?) *solani*: *R.A.M.*, xv, p. 24] until they are two months old, but may remain so much longer, while the causal organism is able to spread through the soil at the rate of 10 in. per month. Sterilization of the soil by means of steam or chloropicrin resulted in perfect stands.

Reinmuth (E.). **Die Blattschüttekrankheit der Luzerne.** [Leaf fall disease of Lucerne.]—*Angew. Bot.*, xxiii, 2, pp. 62–68, 3 figs., 1941.

Heavy damage is stated to have been caused of recent years to lucerne crops in the Rostock district of Germany by the brown spot or leaf fall disease (*Macrosporium* [*Stemphylium*] *sarciniforme*) [*R.A.M.*, vii, p. 380]. The ascigerous stage of the pathogen was referred by Gentner (*Prakt. Bl. Pflanzenb.*, xvi, p. 97, 1918) to *Pleospora herbarum*, but since the latter fungus has also been associated with other conidial forms, e.g., *M. commune*, *M. sarcinula*, and *M. parasiticum* [all synonyms of *S. botryosum*: *R.A.M.*, xviii, p. 141], producing different symptoms from the organism under observation, the systematic position of the agent of leaf fall remains in some doubt [cf. ibid., xx, p. 307]. H. Richter, who first referred the lupin disease to *S. sarciniforme* [ibid., xviii, p. 116], found in subsequent experiments (*Ber. Anst.* (*Reichsanst.*) *Berl.*, 1940) that strains of the organism from clover and lucerne failed to infect lupin and vice versa, while differences in conidial dimensions also indicated that a new species of *Macrosporium* is concerned in the lupin disorder.

Infected lucerne leaves, and later the stems, bear numerous brown to black dots or circular spots, often scarcely reaching 1 mm. in diameter, the larger ones turning paler towards the centre. The disease spreads from the basal to the upper leaves, all the foliage being shed in severe cases, leaving the plant entirely bare. Two- and three-year-old stands sustain the heaviest damage from leaf fall, though older ones may also be affected, while the pathogen further attacks red, white, and

crimson clovers (*Trifolium*) [*pratense*, *T. repens*, and *T. incarnatum*] and various wild *T.* spp. The olive-brown, muriform-septate conidia are stated to be verrucose [a characteristic feature of the conidial stage of *P. herbarum* distinguishing it from the smooth-spored *S. sarciniforme*].

The leaf fall of lucerne is most prevalent in seasons when wet late summer weather follows a dry period, as in 1937, when the fine, warm spell from the end of May to mid-July was succeeded by almost daily heavy rains from 20th July to 1st August. An unduly acid soil reaction (P_H 5·5 to 5·7 in the cases investigated by the writer) also contributes to severe infection. Klinkowski [*R.A.M.*, xvii, p. 325] recommends the incorporation of lime into the soil as a corrective for this condition.

Reinmuth (E.). **Gesundheitsschädigungen durch Verfütterung von pilzkrankem Klee.** [Health disturbances caused by the use of fungus-infected Clover for fodder.]—*Dtsch. landw. Pr.*, lxviii, 12, pp. 103–104, 5 figs., 1941.

Severe and often fatal illnesses, characterized by a sudden onset and virulent course, are reported to occur in horses, cattle, and sheep fed on clover, chiefly alsike [*Trifolium hybridum*], infected by various leaf diseases, notably *Polythrincium* [*Dothidella*] *trifolii* [*R.A.M.*, iv, p. 96; xix, pp. 365, 731], in East Prussia and certain other districts of Germany.

Cherewick (W. J.). **Rhizoctonia root rot of Sweet Clover.**—*Phytopathology*, xxxi, 7, pp. 673–674, 1941.

A species of *Rhizoctonia*, probably a strain of *R.* [*Corticium*] *solani*, has been found to cause a typical damping-off of sweet clover (*Melilotus*) seedlings and a dark brown, dry rot of the roots, stunting, and wilting of two- to four-month-old plants in widely separated districts of Manitoba, Canada, and in Minnesota, this being apparently the first record of the fungus as a pathogen of the host in question. The organism, which is a very rapid grower, covering a Petri dish at 25° to 30° C. in less than 48 hours, and forming brown, irregular sclerotia at the age of two to three weeks at room temperature, was pathogenic in inoculation experiments to numerous varieties of *M. alba*, *M. officinalis*, and *M. suaveolens*, as well as to clover (*Trifolium pratense* and *T. hybridum*), lucerne, peas, soy-bean, and *Vicia angustifolia*. In greenhouse trials during the past three years, 90 to 100 per cent. of the inoculated sweet clover seedlings contracted damping-off, and 50 to 85 per cent. of the older plants were killed, while all the sweet clover plants in artificially infected rows in the field were destroyed in the spring of 1940. The forage yield of the Common Yellow and White Blossom varieties, inoculated after six weeks of growth, was reduced by 47·7 and 32·5 per cent., respectively. Species of *Fusarium* tend to supersede *C. solani* in the later stages of the root rot, for which the latter, however, is regarded as primarily responsible.

Sprague (R.). **Stagonospora arenaria on grasses.**—*Mycologia*, xxxiii, 4, pp. 371–379, 2 figs., 1941.

The synonymy and an emended description are given of *Stagonospora arenaria*, causing a purple leaf blotch of a number of grasses (*Elymus*

arenarius, *E. glaucus*, *E. canadensis*, *E. mollis*, *Dactylis glomerata*, *Arrhenatherum elatius* [*A. avenaceum*], and *Phalaris arundinacea*) in northern Europe, Alaska, Oregon, Washington, Wisconsin, Ohio, and Pennsylvania. The characteristic purple or dark brown lesions, which have light straw or tawny borders on some hosts and yellow to fawn on others, generally fade, as the attacked leaves die, to a straw or buff colour. The pycnidia of the fungus were scattered, not prominent, golden-brown to sepia, subglobose, erumpent, ostiolate, thin-walled, and 50 to 160 (240) μ in diameter. The pycnophores were short, botuliform or subcylindrical; the spores cylindrical or subfusiform, their bases often blunt, tapering to a pointed to blunt apex, hyaline, with small oil drops, with 3 (1 to 4) septa, 26 to 61 by 2·6 to 5 μ, often 30 to 40 by 3·5 to 4·3 μ (smaller on *Arrhenatherum*). The original description, based by Saccardo on a specimen from Sweden, is emended to include the North American material with the smaller pycnidia.

S. arenaria is morphologically very similar to the pycnidial stage of *Leptosphaeria avenaria* (*S. avenae*) [*R.A.M.*, ii, p. 159], but the latter produces no purple blotching on oats and develops both the pycnospores and ascospores in culture whereas *S. arenaria* remains sterile. For the present it is therefore regarded as distinct.

Fischer (G. W.). **'Bends', a new disease of grasses and cereals.**—*Phytopathology*, xxxi, 7, pp. 674–676, 1 fig., 1941.

A new disease of grasses and cereals known as 'bends', first noticed at Pullman, Washington, in 1937, and characterized by a more or less sharp bend in the culm at or above the uppermost node, accompanied by discoloration and brittleness of the affected region, which in extreme cases hangs down parallel with the portion below it, has become increasingly prevalent in the Pacific Northwest. By the end of 1940 the recorded hosts included 8 species of *Agropyron*, 11 of *Bromus*, *Andropogon hallii*, *Dactylis glomerata*, *Secale cereale* × *S. montanum*, Albit wheat, and representatives of ten other genera. From the diseased portions of 16 species of grasses 238 cultures of such fungi as *Alternaria*, *Chaetomium*, *Epicoccum*, *Helminthosporium*, *Hormodendrum*, *Macrosporium*, and *Sclerophoma* were obtained, but so far their part, if any, in the causation of the trouble is unknown.

Warne (L. G. G.). **Observations on the effect of potash supply on the tension of the tracheal contents in fruit trees and bushes.**—*J. Pomol.*, xix, 1–2, pp. 82–86, 1941.

The author presents experimental data referring to the relative tension in the tracheae of apples, gooseberries, and raspberries growing in the field under conditions of potash deficiency and normal manuring. The method used was to fix a plasticine cup round the shoot to be tested, fill the cup with a 1 per cent. solution of acid fuchsin, and stab the stem beneath the surface of the dye. The mean values for penetration of the dye upwards for the plants receiving complete fertilizer were, respectively, 9·07±0·81, 5·98±0·24, and 8·86±0·4 cm., the corresponding figures for the no-potash plants being 13·08±0·73, 7·95±0·41, and 12·04±0·5 cm. These results are significant and it is concluded that, under the conditions prevailing when the observations

were made, there was a greater tension in the tracheae of the no-potash plants than in those of the plants that received a complete fertilizer. Under conditions of good water supply and minimal transpiration the existence of tension probably indicates a slight internal water deficit, with no serious consequences to the plant, but the increased tension due to potash deficiency does indicate a more marked condition of internal drought and a nearer approach to the point at which internal drought becomes a critical factor. Hence in potash-deficient trees this critical point is likely to be reached much earlier than in those receiving a complete fertilizer. This is probably due, among other causes, to (1) increased stomatal frequency caused by potash deficiency, and (2) the poor root development found in potash-deficient plants.

Tydeman (H. M.). **The inheritance of susceptibility to sulphur damage in families of seedling Apples.** —*J. Pomol.*, xix, 1–2, pp. 137–145, 1941.

Observations at East Malling on the reactions of seedlings from crosses between apple varieties to injury from spring applications of lime-sulphur against scab [*Venturia inaequalis*: *R.A.M.*, xix, p. 606] showed that when Stirling Castle, which is highly susceptible to sulphur injury, was used as a parent the proportion of sulphur-shy seedlings (i.e., those susceptible to injury) was high, varying according to the other variety used as parent. Families of crosses not involving Stirling Castle in which White Transparent, Cox's Orange Pippin, and Rote Sommer Apfel were used as one parent averaged 7 to 54 per cent. sulphur-shy seedlings, but in the individual families great variation was present. With most of the other varieties used as parents, only a small proportion of seedlings were sulphur-shy. It is concluded that sulphur-shyness is inherited and is controlled by a number of genes.

Holbeche (J. A.) & Ferguson (S. W.). **Apply borax with care.**— *Agric. Gaz. N.S.W.*, lii, 8, pp. 429, 434, 1 fig., 1941.

Injury having been caused to apple trees in New South Wales as a result of faulty applications and excessive dosages of borax against internal cork, a test was made in which the soil was removed from some of the roots of apple trees of different varieties about 2 ft. (in one case, about 14 in.) from the butt. The exposed roots ranged from $\frac{1}{4}$ to 3 in. in diameter. Borax ($\frac{1}{2}$ to 2 oz.) was then placed on the upper surface of the roots, and the soil replaced. In no case did the quantity of borax applied to any tree exceed the officially prescribed dosage. About one year later, all the treated roots showed severe damage (most being dead for 6 to 12 in. on each side of the point where the borax was applied), and in one case (2 oz. borax applied 14 in. from butt) the trunk itself was injured, the affected part measuring 12 in. long by 2 in. wide.

Recommendations for the application of borax against apple and pear cork are as follows [cf. *R.A.M.*, xviii, p. 155]. If used as a soil dressing, borax should be applied in July or August at the rate of $\frac{1}{4}$ lb. per tree to small bearing trees, $\frac{1}{2}$ lb. to medium-sized trees, and 1 lb. to large trees. It should be spread evenly in a ring about 2 ft.

wide commencing 2 or 3 ft. from the butt, and should be worked into the soil. Young non-bearing trees should not be treated with borax.

Reyneke (J.) & Du Toit (M. S.). **Shoot growth and fruit relationships of the Kelsey Plum.**—*Bull. Dep. Agric. S. Afr.* 219, 54 pp., 4 figs., 14 graphs, 1940.

In part II of this bulletin studies are reported on the rate of ripening of the Kelsey plum in relation to certain physiological disorders in South Africa. It was found that an increased susceptibility of the fruit to Kelsey spot (or heat spot) [*R.A.M.*, xvi, p. 473] in the orchard and to internal browning (a type of internal breakdown [ibid., xix, p. 286] characterized by a browning of the tissue round the stone) and its extreme stage vacuolation (in which the external surface, become dry and totally brown, collapses inwards, particularly round the stem end of the fruit) in storage was associated with an increased rate of ripening of the fruit. This, in turn, resulted from an increased rate of intake of non-reducing sugars by the fruit following a reduction in the shoot growth. Quick-ripening fruits or those with short harvesting periods, usually from crops grown under rigorous conditions, developed vacuolation more readily than slower-ripening fruits or those with long harvesting periods, usually grown under more fertile conditions, which tended to develop soft or crinkly skin (a condition leading to fine cracks in the skin with oozing of the juice) during storage. Immature fruits and those from earlier pickings were more susceptible to internal browning than ripe fruit or those from later pickings, these in turn being more likely to develop soft skin. Within the same area, trees grown on shallow or very light-textured soils tended to produce fruit very susceptible to Kelsey spot and storage disorders, and characterized by a decreased soluble solids/acid ratio and an increased acid content of the juice. Fruits with a soluble solids/acid ratio less than 15 should not be stored, the ratio to aim at being at least 20. It is suggested that the association between the rate of ripening and Kelsey spot is due to the fact that both factors are largely determined by the rate of material inflow into the fruit during the third stage of development. The relationship between rate of ripening and internal browning on the other hand is explained on the basis of a differential ripening of tissues.

Hildebrand (A. A.). **The reaction of Fragaria virginiana to the virus of yellow-edge.**—*Canad. J. Res.*, Sect. C, xix, 7, pp. 225–233, 1 pl., 3 diags., 1941.

In experiments in Canada during 1937, 1938, and 1939, designed to demonstrate the suitability of the common wild strawberry, *Fragaria virginiana*, for use as an indicator plant in yellow-edge virus studies [*R.A.M.*, xix, p. 716], clones of this species were found to vary widely in their resistance and susceptibility to the virus. When runner-grafted to domestic plants of the strawberry varieties Premier and Glen Mary, both symptomless carriers of the virus, some clones of *F. virginiana*, of a noticeably delicate type of growth, were highly susceptible to deterioration and exhibited all symptoms, while among those with a robust growth some showed virtually complete resistance, whereas others, although readily susceptible, were capable of at least partial

recovery. Furthermore, *F. virginiana* is generally much more resistant to root rot than any of the cultivated varieties tested and its use in breeding work is recommended.

Wardlaw (C. W.). **The Banana in Central America.**—*Trop. Agriculture, Trin.*, xviii, 8, pp. 157–163, 10 figs., 1941.

This is a series of three papers reprinted from *Nature, Lond.*, the first dealing with the cultivation of the banana [ibid., 15th March, 1941], the second with the control of leaf spot (*Cercospora musae*) [*R.A.M.*, xx, p. 265], and the third with Panama disease (*Fusarium oxysporum* var. *cubense*) [ibid., xx, p. 266].

Wolfe (H. S.) & Lynch (S. J.). **Papaya culture in Florida.**—*Bull. Fla agric. Exp. Sta.* 350, 35 pp., 1940.

The only two important fungal diseases of papaw in Florida are leaf spot due to *Pucciniopsis* [*Asperisporium*] *caricae* [*R.A.M.*, iv, p. 682; xx, p. 26] and fruit rot caused by a species of *Colletotrichum* identical with or closely allied to *C. gloeosporioides* [loc. cit.]. According to H. E. Stevens [loc. cit.], *A. caricae* responds to three or four applications of Bordeaux mixture (3–3–50) made to the under surface of the mature leaves at fortnightly intervals, after removal of the infected foliage. If conditions favour vigorous growth, the leaves are moderately resistant, and spraying may be unnecessary. Powdery mildew (*Oidium* [*caricae*: loc. cit.]) may also cause considerable injury in a few weeks, but yields to two or three applications of sulphur at ten-day intervals.

Gar (K. A.). **A method for testing Bordeaux mixture.** –*Sadovod.*, *1940*, 4, p. 38, 1940. [Russian. Abs. in *Chem. Abstr.*, xxxv, 14, p. 4907, 1941.]

An ordinary filter paper is immersed in a 5 or 10 per cent. potassium ferrocyanide solution, dried, and cut into small strips, on which an excess of copper sulphate in the Bordeaux mixture may be detected by a pinkish-brown colour. Up to 0·05 per cent. of free copper sulphate produced a perceptible coloration in the writer's tests, and approximately the same concentration was found to cause scorching of foliage in the U.S.S.R.

Stringfellow (W. A.). **Developments in mold and mildew prevention.** —*Amer. Dyest. Rep.*, xxix, 11, pp. P266–P269, 3 diags., 1940.

In tests at the laboratories of the Ciba Company, New York, on samples of cloth inoculated after 6 to 24 hours' exposure to drastic showering with cultures of *Chaetomium globosum* [cf. *R.A.M.*, xviii, p. 696] and incubated at 85° F. for two to three weeks, the best control of the fungus was given by dowicide G (sodium chlorophenate) [ibid., xx, p. 388]. Detailed instructions for the application of the preparation to cloth in open width are given. Field trials in southern localities are in progress to substantiate the promising outcome of these experiments.

Harold (B. A.). **Factors affecting mildew behavior on textiles.** – *Amer. Dyest. Rep.*, xxx, 11, pp. 274–276, 292, 1 fig., 1941.

The writer's own observations on the factors affecting mildew

development on textiles in the United States are reviewed in connexion with the studies along similar lines of Burgess, Galloway [*R.A.M.*, xix, p. 613], and others.

Rière (J.). **Molds: development, identification, prevention.**—*Amer. Dyest. Rep.*, xxix, 8, pp. 211–212, 1940.

This is an abstract of a paper published in *Rev. gén. Mat. col.*, 55, 1939, in which the following information is presented. Highly polymerized cellulose is attacked only by *Mucor* and *Aspergillus*. The general conditions requisite for the development of mould growth on textiles include humidity, absence of bright light, presence of nutrients, depletion of oxygen, a favourable hydrogen-ion concentration, and a temperature range of 20° to 40° C. Black *Aspergillus* [*A. niger* group] grows very slowly at 7°, rapidly at 37°, and not at all above 43°, the white species [?*A. candidus* group] develops most profusely at 25° and ceases to grow at 37°, while the optimum for the green *Penicillium* is 27°, development being arrested above 39°. Rayon, consisting of depolymerized cellulose [cf. *R.A.M.*, xviii, p. 564], is stated to be particularly subject to fungal infection, being completely transformed into glucose by enzymatic action affecting cotton to the extent of only 30 per cent.

Mildew growth liberates heat up to 70°, and this may aid in its detection. Microscopic examination is facilitated by the German practice of boiling in water, treating for a minute or two in a hot aqueous solution of phenol, lactic acid, and glycerine, and then immersing for several minutes in a solution of direct blue dye. After rinsing and re-heating in the lactophenol solution to remove excess of dye, the mildewed parts remain coloured and the fibres are ready for examination.

Among the most effective antiseptics may be mentioned salicylic acid, beta-naphthol [ibid., xviii, 56, *et passim*], aristol, the sodium salt of para-chlorometacresol [ibid., xix, p. 318], hexylresorcinol [loc. cit.], and emulsions of zinc or aluminium naphthenate. In this connexion it should be remembered, however, that every antiseptic is not equally effective against all moulds, *Fusarium*, for instance, having been known to develop on a starch mixing containing 10 per cent. zinc chloride, while one or two species of *Aspergillus* utilize salicylic acid. Boiling the fabric may counteract the incipient stages of mould growth, or light chlorination or treatment with 2 per cent. ammonia water may be tried, but even if the visible effects are removed, the weakening of the fibre and modification of its dye affinity will persist.

Buller (A. H. R.). **The diploid cell and the diploidisation process in plants and animals, with special reference to the higher fungi. I. II.**—*Bot. Rev.*, vii, 7, pp. 335–387; 8, pp. 389–431, 1941.

Among the many aspects of diploidization covered by this valuable critical survey of the subject and related topics may be mentioned the introductory section on sexuality, homothallism, the path of nuclear migration in the higher fungi, haploidy, heterokaryosis in certain Pyrenomycetes and the rusts, discussions of (*a*) Dodge's views on sex and inheritance [*R.A.M.*, xix, p. 160], (*b*) the various systems of

terminology applied to the nuclear phase of the higher fungi, and (*c*) the 'Buller phenomenon', the diploidization of a haploid mycelium or structure by a diploid mycelium. An eight-page bibliography is appended.

Gray (P. H. H.). **A solution for staining differentially the spores and vegetative cells of micro-organisms.**—*Canad. J. Res.*, Sect. C, xix, 4, pp. 95–98, 1941.

In this paper the author describes a single-solution staining method for the differentiation of spores and vegetative cytoplasm of bacteria, yeasts, and certain fungi, requiring no heating or subsequent decolorization or counterstaining. The solution consists of 0·50 per cent. malachite green and 0·05 per cent. basic fuchsin in distilled water. For use with *Aspergillus* and *Penicillium*, the solution is diluted with four times its bulk of 0·8 per cent. sodium chloride solution. In this form it is applied on a cover glass to colonies growing on agar plates.

Fulton (R. W.). **The behaviour of certain plant viruses in plant roots.**—*Phytopathology*, xxxi, 7, pp. 575–598, 4 figs., 1 graph, 1941.

At the Wisconsin Agricultural Experiment Station the behaviour was investigated of the tobacco mosaic, cucumber mosaic, potato ring spot, tobacco ring spot, severe etch, and tobacco streak viruses in the aerial parts and roots of various hosts, especially Havana seed tobacco and John Baer tomato. All viruses systemic in the aerial portions of the host plants were able to invade the roots 5 to 15 days after inoculation of the leaves.

Inoculation of the roots of the tobacco and tomato with several different viruses resulted in good root infection, but no infection of the aerial parts, the virus movement upward being very slow and restricted, whereas downward it was relatively rapid, corresponding to the rate of downward movement in the leaves and stems.

In contrast to the unidirectional movement observed in inoculated roots, the tobacco mosaic virus moved in both directions from an inoculation at the base of tomato stems [*R.A.M.*, xviii, p. 823]. In experiments to determine the effects of daily alternations of light and darkness on the movement of the virus in tomato plants inoculated at the stem bases, total darkness was found to prevent upward but permitted slow downward migration, whereas under constant illumination the virus travelled almost simultaneously in both directions. It was found possible to reverse the downward movement of the tobacco mosaic virus in darkened tobacco and tomato plants by immersion of the inoculated roots in a solution containing sugar, mineral salts, and yeast extract, strongly suggesting that the trend of virus movement in plant roots is determined by the position of supply of organic food materials.

Root extracts diluted 1 to 1,000 of tobacco and tomato plants infected with ordinary tobacco mosaic virus were found to be less infectious to tobacco foliage than leaf juice from the same plant, and experiments confirmed the observations by Stanley [ibid., xviii, p. 212] and Price [ibid., xii, p. 120] that the virus concentrations tend to be lower in the roots than in the leaves. Root extracts of healthy tobacco and tomato plants exerted a marked inactivating influence on the

tobacco mosaic virus, reducing the number of lesions on tobacco leaves inoculated from 928 and 661, respectively, for the virus and healthy leaf extract mixtures to only 71 and 174, respectively. It appears probable, therefore, that the inhibitory influence of healthy tobacco root extract is related to the low infectivity of the root extract of diseased plants.

The thermal inactivation points of the tobacco mosaic, cucumber mosaic, tobacco ring spot, and severe etch viruses produced in tobacco roots were several degrees lower than for the same material in the foliage, viz., 84°, 67°, 59°, and 57°, respectively, compared with 92°, 72°, 64°, and 60°, respectively, similar results being obtained with tobacco ring spot in sunflower, *Zinnia elegans*, *Calendula officinalis*, and cucumber. These data indicate that some property peculiar to the root extract reduces the heat tolerance of the virus.

JOHNSON (F.). **Transmission of plant viruses by Dodder.**—*Phytopathology*, xxxi, 7, pp. 649–656, 1 fig., 1941.

Successful transmission from diseased to healthy plants of the viruses of aster yellows, tomato bushy stunt, cucurbit mosaic, beet curly top, tobacco mosaic, and white clover [*Trifolium repens*] virus 1 [*R.A.M.*, xv, p. 274] was effected at the Rockefeller Institute for Medical Research, Princeton, New Jersey, by means of dodder (*Cuscuta campestris*). The healthy test plants were connected with diseased ones by one or more dodder stems 10 in. or more in length, or parasitized by 2 in. sections from the tips of dodder stems that had grown on infected hosts. The aster yellows virus was conveyed to 4 out of 50 plants of *Callistephus chinensis* and 6 out of 30 of *Nicotiana rustica* in periods of 40 and 35 days, respectively, and the white clover mosaic virus to broad beans (9 out of 12) and 5 out of 8 hop clover (*Medicago lupulina*) in 23 and 30 days, respectively. The remaining viruses were transmitted to their own hosts only as follows: bushy stunt (5 out of 20 in 23 days), cucurbit mosaic (7 out of 22 in 21 days), beet curly top (7 out of 16 in 19 days), and tobacco mosaic (13 out of 26 in 26 days).

The white clover virus 1 was found to consist of two distinct components, only one of which was transmissible to broad beans and *M. lupulina* by means of *Cuscuta campestris*, while the other was isolated in cowpeas by mechanical inoculation with juice from mosaic-diseased white clover. A combination of the two viruses produced typical streak symptoms on peas.

The dodder method of virus transmission is applicable to a wider range of diseases than grafting, but is less efficient and the incubation periods are longer than those required for mechanical or insect conveyance.

NICKERSON (W. J.) & THIMANN (K. V.). **The chemical control of conjugation in Zygosaccharomyces.**—*Amer. J. Bot.*, xxviii, 7, pp. 617–621, 4 figs., 1 graph, 1941.

In agar cultures of a species of *Zygosaccharomyces* [unspecified] contaminated with *Aspergillus niger*, conjugation of cells was found to be much more active than in pure cultures. It was concluded that *A. niger* secretes a conjugation-promoting substance into the medium.

In further experiments it was demonstrated that in four-day-old cultures of the *Zygosaccharomyces* sp. grown on fresh malt extract broth only 12 per cent. of the cells were conjugating as compared with 71 in cultures of the same age grown on a filtrate of *A. niger*. The conjugation-promoting substance was fully soluble in 90 per cent. alcohol, but insoluble in acetone or chloroform. In the absence of *A. niger* conjugation was more active in old pure cultures of the *Zygosaccharomyces* sp. than in younger ones. Extract from a culture of the *Zygosaccharomyces* prepared in the same way as the *A. niger* filtrate also promoted conjugation, but was somewhat toxic or inhibitory at high concentrations, while *A. niger* extracts showed no such effects. The presence of *A. niger* had a conjugation-promoting effect on the cultures of two other species of *Zygosaccharomyces*.

Saksena (R. K.). **Importance of growth-promoting substances in the metabolism of Pythium indigoferae Butler.**—*J. Indian bot. Soc.*, xx, 4, pp. 183–189, 1941.

In a cultural study of *Pythium indigoferae* [*R.A.M.*, xv, p. 244] it was shown that the fungus is able to grow on a synthetic medium containing peptone or hydrolysed peptone as the source of nitrogen, but not on one containing various amino acids. The organism did not respond to thiamin, but required for growth an extraneous supply of growth-promoting substances such as are present in casein extract, lentil extract, or yeast.

Storey (I. F.). **A comparative study of strains of Rhizoctonia solani (Kuhn) with special reference to their parasitism.**—*Ann. appl. Biol.*, xxviii, 3, pp. 219–228, 1 pl., 4 graphs, 1941.

The results of cross-inoculation experiments with 13 different strains of *Rhizoctonia* [*Corticium*] *solani* showed that some strains have a very restricted host range while others are less markedly specialized. The strains isolated from potato and one from tomato attacked only solanaceous hosts, whereas another tomato strain was pathogenic to lettuce as well as tomato. Isolates from cruciferous plants attacked only these hosts. Isolates from the composites lettuce and zinnia infected only these, while the endive strain attacked swede but not lettuce or any other test host. The strain from beet was unable to attack any of the plants used and those from cotton and grass were capable of attacking both cruciferous and solanaceous hosts. These results were obtained by a technique which involved the addition to the soil of not more than 0·1 per cent. organic matter. When varied amounts of inoculum were applied to a soil maintained at 60 per cent. of its water-holding capacity, inocula of high organic content markedly inhibited the germination of swedes owing, it is thought, to some toxic chemical effect. From a study of the behaviour of the potato 1 and radish isolates on susceptible and non-susceptible hosts, it appeared that the resistance of crucifers to the isolates from potato was correlated with the presence of a substance which inhibited the growth of the fungus, while the appropriate strain was able to tolerate it. When cultured on autoclaved plugs of potato tuber and swede root tissue, each of the potato and radish strains secreted pectinase enzyme most

actively when grown on plugs of the appropriate host; the maximum enzymic activity was produced by the potato strain in 5 as against 15 days needed by the radish strain, and this effect obtained on either host. The action of the crucifer strain of the fungus was almost completely inhibited on blocks of turgid swede tissue as compared with that on subturgid blocks, but the enzyme was more active on the former.

BALD (J. G.) & NORRIS (D. O.). **Obtaining virus-free Potatoes.**—*J. Coun. sci. industr. Res. Aust.*, xiv, 3, pp. 187–190, 1941.

The authors state that it may be assumed that more than 90 per cent. of the potatoes grown in Australia are infected by virus X [*R.A.M.*, xviii, p. 656]. If this virus could be eliminated, the yield would be so increased that about four-fifths of the present potato area would suffice. The losses from virus X appear to be at least as heavy as those from all other virus diseases combined, and probably amount in cash to £350,000 a year.

In 1936, the senior author succeeded in finding one plant of the principal New South Wales variety, Factor (Up-to-Date), which appeared to be unaffected. It was protected from infection in the field, was harvested early, and bore 13 tubers. This stock, though also unaffected, was found to carry the leaf roll virus.

A second attempt to find a virus-free Factor plant was begun in 1940 with 960 tubers from a grower of certified seed in New England, [New South Wales]. During several months, inoculations were made from each tuber to pepper [? *Capsicum annuum*] or Epicure potato plants. By the end of November, 1940, 28 plants had caused no reaction, all the others being proved to contain virus X. The 28 tubers were then cut in half, and one lot returned to the original grower in New England to be planted in an isolation plot, while the other lot was similarly planted at Uriarra, about 20 miles from Canberra. While the inoculations were in progress, a single eye was cut from each tuber and planted in a pot in the greenhouse. Further inoculations were made, and eliminated all but 13 tubers. In February, 1941, a detailed examination of the plants in the New England plot demonstrated 13 to be virus-free; the same number also showed freedom from all virus infection at Uriarra.

Further experiments left no doubt that most, and probably all, of these 13 plants are free from virus X. The healthy appearance of the plants when growing under good conditions and their high yield in an infertile soil encourage the belief that ten at least are free from any virus infection. They form the basis of a possible virus-free stock to replace the infected stocks at present grown.

BALD (J. G.). **Potato virus diseases, the scientist and the farmer.**—*Fruit World, Melbourne*, xlii, 6, pp. 17–18; 7, pp. 17–18, 1941.

In these popular notes on potato virus diseases in Australia the author states that the tomato spotted wilt virus is important on potatoes in the Adelaide Plains and in the Mount Lofty Ranges. The virus causes collapse and death of the young tissues. It passes into the tubers and if they are young causes dead spots, cracking and distortion resulting when the unaffected portions of the tubers continue to grow.

It is not known how often infected tubers will give diseased plants, but it is known that shoots from such tubers die back and the tubers 'miss'.

The principles of control by certification are discussed, and the paper concludes with recommendations for the maintenance of seed plots. The policy of controlling leaf roll and mosaic by certification while discounting the ubiquitous potato virus X [see preceding abstract] is considered sound at the present time.

BALD (J. G.). **A report on agricultural features of the Australian Potato industry.**—*Pamphl. Coun. sci. industr. Res. Aust.* 106, 72 pp., 2 graphs, 2 maps, 1941. [Photo-lithographed.]

In the section on potato diseases of this report (pp. 42-58) it is stated that the losses due to diseases (excluding latent mosaic) and pests in Australia approach or exceed 20 per cent. of the potential total yield, entailing the virtual waste of 25,000 acres of each season's planting or 65,000 tons of the production. The most important diseases are those caused by viruses, *Rhizoctonia* [*Corticium solani*], *Actinomyces scabies*, and *Spongospora subterranea*, wilts (*Verticillium albo-atrum* and *Fusarium* spp.), tuber rot (*Pythium de Baryanum*), and early and late blights (*Alternaria solani* and *Phytophthora infestans*); early blight is more widespread and on the whole more troublesome than late, epidemics of which are rare except in northern New South Wales and Queensland.

The following conservative estimates have been computed for percentage losses incurred through preventable virus diseases (comprising all except latent mosaic) in the most widely grown varieties: Carman 31, Brownell (Satisfaction) 26, Up-to-Date (Factor) 18, Snowflake 4, Delaware 6, Bismarck 8, and miscellaneous 7.

NATTRASS (R. M.). **Notes on plant diseases.**—*E. Afr. agric. J.*, vii, 1, p. 56, 1 pl., 1941.

Napier grass (*Pennisetum purpureum*) in Kenya is frequently affected, especially during the rainy season, by white mould due to *Beniowskia sphaeroidea* [*R.A.M.*, xvi, p. 796]. The fungus is common throughout East Africa, readily attacking both varieties of Napier grass, and sometimes occurring on other grasses, including *P. clandestinum*. The effect of infection is very localized, and moderate attacks have little effect on plant vigour. In severe infection, browning of the leaves from the tips may be present; in such cases, it may be advisable to cut down the growth.

Recent heavy losses in shipments of potatoes from South Africa are stated to be probably due in large part to black heart [ibid., xviii, p. 134] induced by oxygen deficiency. Immature tubers may become affected even under open-air conditions if exposed to temperatures of 38° C. or over. Care should be taken when lifting potatoes to ensure that they are not exposed to the direct rays of the sun, particularly if immature potatoes are being dug, as may occur during a shortage. Adequate ventilation is essential during transit, even if only a short journey is involved. The Tinwald Perfection and Duke of York varieties are resistant, whereas Majestic is highly susceptible. The popularity of the Italian white potato on the Indian market is largely

due to its resistance to high temperatures. Affected tubers should not be planted.

Nisikado (Y.) & Kimura (K.). **A contribution to pathological anatomy of Rice plants affected by Gibberella fujikuroi (Saw.) Wollenweber. I.**—*Ber. Ōhara Inst.*, viii, 4, pp. 421–426, 2 pl., 2 graphs, 1941.

The microscopic examination of the culms of rice plants suffering from the 'bakanae' (elongation) disease caused by *Gibberella fujikuroi* in Japan [*R.A.M.*, xx, p. 491] disclosed the presence of the mycelium and microconidia in the vascular bundles, the large pitted vessels and lacunae of the xylem being extensively occupied, while the phloem and soft parenchyma cells were invaded only in a few severely damaged culms. Apparently healthy parts of affected plants may contain mycelium and microconidia. Macroconidia were usually observed only in cases of advanced infection on the inner side of the leaf sheaths near the node. Details are given of the distribution of the mycelium in relation to the position of the nodes as revealed both by microscopic and cultural methods, the results of which were generally in agreement except that the latter indicated discontinuity in the development of the fungus along two of the four test plants, mycelium being present in one up to a point above the third node, at which it disappeared, to resume growth above the fifth, while in another the mycelium was absent from a point just above the second to the sixth node, inclusive, reappearing above the seventh and eighth. Such interruptions probably reflect the ordinary course of infection in nature.

South American leaf spot disease of Hevea.—*Rep. Canal Zone exp. Gdns, 1940*, pp. 28–29, 1941.

So far it has not been possible to trace the origin of the epidemic of South American leaf spot disease (*Dothidella ulei*) of *Hevea* rubber [*R.A.M.*, xx, p. 223] in Panama, which coincided with the commencement of planting operations by the Goodyear Rubber Company near Gatun Lake in 1935. The Company's material was all obtained either from the Philippines, where *D. ulei* is unknown, or from the Canal Zone Experiment Gardens, in which the first outbreak of infection occurred in 1939. Some of the several thousands of seeds introduced from Haiti in 1931 and planted in an isolated site near Summit are now badly infected by the fungus, though apparently healthy at a previous inspection in 1938. It is suspected that many of the trees, e.g., members of the large family of the Euphorbiaceae, in Panama forests may harbour the pathogen, and all species of the 25 genera of this family at least should be investigated as potential hosts.

Riceman (D. S.), Donald (C. M.), & Evans (S. T.). **Further investigations on copper deficiency in plants in South Australia.**—*Pamph. Coun. sci. industr. Res. Aust.* 96, 44 pp., 10 pl., 1940. [Photolithographed.]

The results of further investigations on the mineral nutrition of plants in the calcareous sandy soils along the South Australian coast amply confirmed previous observations on the severe copper deficiency [reclamation disease] obtaining in these areas [*R.A.M.*, xviii, p. 163].

Subterranean clover [*Trifolium subterraneum*] grown on the soil in question in 4 kg. pots responded favourably to the application both of iron (57·5 or 230 mg. ferrous sulphate, equivalent to 28 and 112 lb. per acre, respectively) and copper (20·6 or 165 mg. = 10 and 80 lb., respectively). The maximum yields of oats and wheat were secured by the incorporation with the soil of 14 to 56 lb. copper sulphate per acre, no further increases resulting from treatment with manganese, iron, or nitrogen. Potash, however, at the rate of 112 lb. per acre (potassium sulphate) increased the grain and straw yields of oats by 151 and 310 lb., respectively, where copper sulphate had already been applied in doses of 56 lb. per acre. Late applications (29th September, 1938) of copper sulphate to a crop of oats showing typical 'wither tip' and foliar limpness resulted in rapid recovery.

A vigorous six-acre pasture of black medick (*Medicago lupulina*) and Wimmera rye grass (*Lolium* sp.) was established in 1937–8 by the use of copper sulphate at the rate of 17 lb. per acre. The copper contents of the grain and straw of plants exhibiting severe copper deficiency symptoms ranged from 1 to 3 mg. per kg. dry matter.

Waksman (S. A.) & Woodruff (H. B.). **Actinomyces antibioticus, a new soil organism antagonistic to pathogenic and non-pathogenic bacteria.**—*J. Bact.*, xlii, 2, pp. 231–249, 3 figs., 1941.

This is an expanded account of *Actinomyces antibioticus*, the soil antagonist of fungi and bacteria recently discovered at the New Jersey Agricultural Experiment Station [*R.A.M.*, xx, p. 322, where 'ether' in l. 23 should read 'petrol ether'], accompanied by a technical diagnosis [in English only]. The separation of actinomycin into two fractions, A and B, was effected by the use of petrol ether, only B being soluble.

Ulbrich (E.). **Der Blasenbrand der Helleborus-Arten.** [The blister blight of *Helleborus* spp.]—*Notizbl. bot. Gart. Berl.*, xv, pp. 62–67, 1940. [Abs. in *Zbl. Bakt.*, Abt. 2, ciii, 18–20, p. 373, 1941.]

The controversial problem of the terminology of the blister blight of *Helleborus* spp. is discussed, the author's conclusion being that the only valid name for the fungus is *Urocystis pompholygodes* (Schlechtd.) Rabenh., a complete list of synonyms being appended. The geographical distribution of the pathogen and its occurrence on the different species of hellebore are reviewed.

Reichert (I.). **Stem blight of the Castor Bean.**—Reprinted from *Palest. J. Bot.*, R Ser., iii, 1–2, 4 pp., 1 fig., 1940.

Fusarium orthoceras and *F. semitectum* were isolated from the blackened and decayed roots of castor beans (*Ricinus communis*) suffering from wilt at Ashdot Ya'aqov in the Jordan Valley, where the plant is used as a windbreak in banana and orange plantations, this being the first record of the former organism on the host in question [cf. *R.A.M.*, xix, p. 675], whereas the latter has already been reported from Italy [ibid., xvii, p. 135]. The disease causes heavy damage, which is increasing annually; in 1937 some 35 per cent. of the plants were affected, while in 1939 only a few remained healthy in a hedge of about 5,000. Inoculation tests are necessary to determine the relative

importance of the two species in the etiology of the disease, but in the meantime the formation of sporodochia on the stem points to *F. orthoceras* as the principal pathogen, these organs not being produced by *F. semitectum*. *Diplodia natalensis* frequently develops under the bark of plants in an advanced stage of wilt, but its part in the etiology of the disease has not yet been ascertained.

Rafay (S. A.) & Padmanabhan (S. Y.). **Sugarcane smut in Bihar.**—*Curr. Sci.*, ix, 11, pp. 496–497, 3 figs., 1940.

Sugar-cane smut was observed in Bihar in 1940 before, instead of after, the monsoon, and in fresh localities. During July, interesting examples of spike formation [which are described] were encountered in the five-months-old crop. Spores from collections in several localities closely agreed with those of *Ustilago scitaminea* [*R.A.M.*, xx, p. 135], but one collection from Buxar resembled *U. scitaminea* var. *sacchari-barberi* [ibid., xix, p. 238].

Abbott (E. V.) & Tippett (R. L.). **Myriogenospora on Sugar Cane in Louisiana.**—*Phytopathology*, xxxi, 6, pp. 564–566, 1 fig., 1941.

The symptoms of stunted C.P. 28/19 sugar-cane plants observed near Raceland, Louisiana, with whip-like foliage, the tips of the unfolding leaves being held firmly down along the midrib of its predecessor by a black fungal stroma, agreed with those characteristic of infection by *Myriogenospora aciculisporae*, hitherto reported only from the Argentine and Brazil [*R.A.M.*, xviii, p. 624], while the ascospore measurements and other features of the pathogen also corresponded with Vizioli's diagnosis [ibid., vii, p. 537]. Possibly, however, the species under observation may be identical with that detected by Diehl on *Andropogon* and tentatively referred to *M. paspali* [ibid., xiii, p. 706].

Moesz (G. v.). **Fungi Hungariae. IV. Basidiomycetes—Pars 1. Uredineae.** [Fungi of Hungary. IV. Basidiomycetes—Part 1. Uredineae.]—*Ann. Mus. nat. Hung.*, Pars bot., xxxiii, pp. 127–200, 1940. [Hungarian, with German summary and annotations.]

This critically annotated list comprises over 150 species of rusts out of a total of more than 400 stated to occur in Hungary, among those of special interest being six species of *Gymnosporangium* on juniper and pomaceous hosts; *Phragmidium rubi-idaei* [*R.A.M.*, xix, p. 567] on raspberry; *Puccinia agrostidis* on *Agrostis alba* (aecidia on *Aquilegia vulgaris*); *P. antirrhini* on *Antirrhinum majus*; *P. apii* on celery; *P. arrhenatheri* on *Arrhenatherum elatius* [*A. avenaceum*] (aecidia on barberry) [ibid., xii, p. 536]; *P. cichorii* on chicory [ibid., ix, p. 503]; *P. helianthi* on sunflower and artichoke (*Helianthus tuberosus*); *P. malvacearum* on various Malvaceae, including *Althaea officinalis*; and *P. mentha* on *Mentha* spp., including *M. longifolia* and *M. piperita*, *Origanum vulgare*, and *Satureia vulgaris*.

Hansford (C. G.). **Contributions towards the fungus flora of Uganda. III. Some Uganda Ascomycetes.**—*Proc. Linn. Soc. Lond., 1940–41*, 1, pp. 4–52, 12 figs., 1941.

This critically annotated list of over 300 Ascomycetes continues the

author's earlier paper on the fungal flora of Uganda [*R.A.M.*, xvii, p. 415], a supplement to which appeared in *J. Linn. Soc.* (*Bot.*), li, 340, pp. 537–545, 1938. The present list comprises 11 species of *Elsinoe*, of which seven are new, including *E. piperis*, while *E. tephrosiae* [*R.A.M.*, xvii, p. 297] receives an amplified description. Other interesting records are *Oidium caricae* on papaw, *Uncinula necator* on vine, *O. tingitaninum* on *Aegle marmelos*, *Ceratostomella paradoxa* causing finger-tip rot of bananas, *Paranectria hemileiae* n.sp. on sori of *Hemileia vastatrix* on coffee leaves (among other hyperparasites described), *Claviceps digitariae* n.sp. on *Digitaria scalaris*, and *Dictyopeltis consimilis* on *Balsamocritus* sp.

Ainsworth (G. C.). **Contributions towards the fungus flora of Uganda. IV. The Ustilaginales of Uganda.**—*Proc. Linn. Soc. Lond.*, *1940–41*, 1, pp. 92–97, 1941.

This critically annotated list of 25 Ustilaginales from Uganda [see preceding abstract] includes three new species, as well as *Entyloma australe* on *Physalis peruviana*, *E. dahliae* on cultivated *Dahlia*, *Sorosporium reilianum*, *Sphacelotheca cruenta*, and *S. sorghi* on sorghum, *Ustilago kamerunsis* on *Pennisetum purpureum*, and *U. tritici* on wheat.

Cummins (G. B.). **Uredinales of New Guinea—IV.**—*Mycologia*, xxxiii, 4, pp. 380–389, 3 figs., 1941.

This list of 28 species (13 new) of Uredinales collected by Mrs. M. S. Clemens in Morobe District, New Guinea [*R.A.M.*, xix, p. 616], comprises *Uromyces phaseoli* [*U. appendiculatus*] on bean (*Phaseolus vulgaris*), and two new species, *Uredo passiflorae* on *Passiflora* sp. and *U. pseudocannae* on *Canna indica*.

Drechsler (C.). **Three species of Pythium with proliferous sporangia.**—*Phytopathology*, xxxi, 6, pp. 478–507, 13 figs., 1941.

Continuing his studies on the genus *Pythium* [*R.A.M.*, xix, p. 435], the writer gives additional details of *P. oedochilum* found associated with diseased dahlia roots (and subsequently discoloured *Bidens aristosa* roots) and *P. palingenes*, first described in 1930 [ibid., x, p. 211] from discoloured roots of *Ambrosia trifida*. A detailed account is also given of *P. marsipium* n.sp. which, together with *P.* (?) *proliferum* and *P.* (?) *undulatum*, was found associated with water-soaked or discoloured areas on the foliage of white water lilies (including *Nymphaea odorata* and *N. tuberosa*) in the northern United States.

Harter (L. L.). **The personal element and light as factors in the study of the genus Fusarium.**—*J. agric. Res.*, lxii, 2, pp. 97–107, 1941.

In continued studies on *Fusarium martii* var. *pisi* and *F. bulbigenum* var. *batatas* [*R.A.M.*, xviii, p. 609], a statistical analysis of results showed that conidial measurements taken by different investigators from the same microscopic preparation of the same species may vary considerably when groups of 50 spores are counted, but that 150 to 200 measurements may be taken to represent a fairly reliable sample of a population provided the spore suspensions are carefully prepared and mounted. There was no significant difference in the ratio of three,

four, and five septations of the conidia in different microscope mounts made from the same spore suspension, but highly significant differences sometimes occurred between culture tubes of the same species grown on the same medium. It is concluded, therefore, that a single tube culture is not representative of a number of tube cultures. Exposure to light was found to increase the size and number of septations of the conidia, those with one or two septa being predominant and those with four or five either rare or entirely lacking in cultures grown in the dark, while conidia with four or five septa were predominant and abundant in cultures exposed to irradiation by a 200-watt Mazda lamp at a distance of 26 in.

Ulbrich (E.). **Über die Tilletiaceen-Gattungen Tuburcinia Fr. 1832, Urocystis Rbh. 1856 und Ginanniella Ciferri 1938.** [On the genera of the Tilletiaceae *Tuburcinia* Fr. 1832, *Urocystis* Rbh. 1856, and *Ginanniella* Ciferri 1938.]—*Notizbl. bot. Gart. Berl.*, xv, pp. 68–84, 1940. [Abs. in *Zbl. Bakt.*, Abt. 2, ciii, 18–20, p. 372, 1941.]

The author fully discusses the terminological problems affecting the validity of the generic names *Urocystis* and *Tuburcinia*, and shows that Liro's conception of the scope of *Tuburcinia*, involving as it would the re-naming of practically every species of *Urocystis*, is at the very least highly problematical; the retention of the generic name *Urocystis* Rabenhorst 1856, with the type species *U. occulta* (Wallr.) Rabenh. 1856, is therefore recommended as a *nomen conservandum* [*R.A.M.*, xix, p. 567]. Fries's hybrid genus *Tuburcinia* might be retained for the single species, *T. orobanches*, comprised therein. In this latter species the spore balls, composed as in *Urocystis* of a few, usually one to three, individual spores, are enveloped in a thick, sometimes two-layered sheath of accessory cells, preventing their disintegration, in contrast to *Urocystis*, in which there is no protective membrane to unite the separate spores. In recognition of these morphological differences as a generic character, the genus *Tuburcinia* Fries 1832 em. Ulbrich would be maintained with *T. orobanches* (Mérat) Fr. 1832 as the type and hitherto sole known species. All species with non-disintegrating spore balls composed of numerous (10 to 70) flattened individual spores and producing a mycelial-conidial generation should be referred to the genus *Ginanniella* Ciferri 1938 em. Ulbrich with the type species *G. trientalis* (Berk. & Br.) Cif. 1938 [ibid., xvii, p. 842]. Three species are added to the last-named genus, for which a more detailed diagnosis is given.

Wollenweber (H. W.). **Diplodia sarmentorum Fries und ihre Verbreitung.** [*Diplodia sarmentorum* Fries and its distribution.]—*Zbl. Bakt.*, Abt. 2, ciii, 18–20, pp. 347–357, 1941.

Diplodia sarmentorum [*R.A.M.*, xvi, p. 335] is here identified from published exsiccata on about 150 host plants belonging to 100 genera, and is held to have been described under nearly 150 different specific names, nearly all from European material. The author has collected and inoculated it on *Menispermum* (the type host), pear, lime (*Tilia*), elm, *Sophora*, and *Cydonia*. His cultures formed pycnidia freely, and those isolated from the first four were inoculated into apple and quince

fruit, causing a rot but much more slowly than isolations of *D. pseudodiplodia*, *D. rudis*, *D. gallae*. *D. mutila*, and *D. palmicola*. The pycnidia are stated to be scattered, glistening, black, and 0·2 to 0·4 mm. in diameter; the spores bicellular, dark brown, and either subcylindrical and rounded at both ends, or oval and rather constricted. The mean measurements are 22 by 10 μ, with a usual range of 21 to 25 by 9 to 11 μ and an extreme range of 18 to 29 by 7·5 to 15 μ. The other species of *Diplodia* mentioned above can be separated by the mean measurements of their pycnospores.

Singer (R.). **Is Shiitake a Cortinellus?**—*Mycologia*, xxxiii, 4, pp. 449–451, 1941.

Discussing the taxonomic position of the edible fungus 'shiitake', the author states that it cannot be included in *Cortinellus* [cf. *C. shiitake*: *R.A.M.*, xviii, p. 434] because it does not resemble *C. bulbiger*, to which, according to the modern conception, this genus is restricted; nor is it a *Cortinellus* of the *Tricholoma vaccinum* type, from which it differs in the structure of the hyphae and its growth on wood. On the other hand, all diagnostic characters are considered to point to *Lentinus* and the mushroom is consequently renamed *L. edodes* (Berk. non Schröt.) Singer, comb. nov. [? syn. *Agaricus* (*Armillaria*) *edodes*: ibid., xv, p. 684]. The 'matsutake' fungus [known as *Armillaria matsutake*: loc. cit.] is regarded as a form of the *T. caligatum* group, and perhaps identical with that species.

Gadd (C. H.). **Report of the Mycologist for 1940.**—*Bull. Tea Res. Inst. Ceylon* 22, pp. 32–38, 1941.

In this report [cf. *R.A.M.*, xix, p. 677] the author states that in April and May, 1940, he received specimens of *Albizzia* seedlings from the Balangoda and Bimbula districts of Ceylon showing the leaf disease reported by Petch in 1914 from the Ratnapura area as caused by a fungus which he later named *Ceratophorum albizziae* [cf. ibid., xviii, p. 282]. All the specimens were seriously defoliated, and the leaflets that remained on the plants showed pale brown spots caused by the fungus, which was also present on the fallen leaves. The only treatment consists in preventive spraying with a copper fungicide before serious damage has been done.

Scab, though seldom of economic importance, is often found on the older leaves of tea bushes, but seldom, if ever, affects the flush. Affected leaves fail to attract attention until the condition has reached an advanced stage, when characteristic scabs appear on the upper surface of the leaves. They are large, irregular, intermingled black and grey, irregularly blistered and cracked and frequently extend over a great part of the leaf. The discoloration does not generally affect the under surface of the leaves. The condition is associated with *Elsinoe theae* [ibid., xix, p. 369].

Bond (T. E. T.). **Report of the Assistant Mycologist for 1940.**—*Bull. Tea Res. Inst. Ceylon* 22, pp. 39–42, 1941.

In this report the author states that phloem necrosis has now been found on 113 tea estates in Ceylon [*R.A.M.*, xix, p. 677], and only on

five occasions has it been identified at elevations under 4,000 ft. As a rule, a reliable diagnosis can be made from an inspection of the bush and an examination of a few leaves cut or broken off at the petiole. Rate of spread varies in different localities, but may be extremely rapid. In one large plot in the Kandapola area, the percentage of affected bushes has doubled in two years, the last record giving 524 necrotic bushes out of 985, or 53 per cent. affected. The evidence indicates that several years may pass before severe symptoms develop, and it may be even two years before a reliable diagnosis can be made. At St. Coombs, and probably in most areas of low altitude, spread in the field is relatively slow, and may affect only 5 per cent. of the bushes every year. At the lower altitudes also, the effects are less conspicuous, and it is frequently difficult to identify the condition without microscopic examination. Statistical data show that the disease, in addition to a random dispersal, shows a distinct tendency to spread from bush to bush along and across the rows. The continued absence of the disease from young plants of the high jat type suggests that these, at least, are strongly resistant. There is no evidence that transmission can occur mechanically, i.e., by needle prick or the transfer of inoculum by plucking or pruning. The disease appears to have been transmitted by grafting [ibid., xviii, p. 712], though not in its typical form.

Investigation of the distribution of necrotic symptoms in the shoot revealed that the banji shoot is usually necrotic throughout, including the apical bud. As the bud expands and the new flush develops, the necrosis is at first confined to the base (the region of the fish leaf), and only when the rate of plant growth declines is it observed to spread. The apex again becomes necrotic soon after the flush growth ceases.

Valleau (W. D.). **Experimental production of symptoms in so-called recovered ring-spot Tobacco plants and its bearing on acquired immunity.**—*Phytopathology*, xxxi, 6, pp. 522–533, 3 figs., 1941.

Six strains of the tobacco ring spot virus of diverse origin were found in studies at the Kentucky Agricultural Experiment Station in 1939–40 to be distinct, and in this connexion attention is drawn to the inapplicability of Holmes's proposed Latin trinomial system of nomenclature [*R.A.M.*, xix, p. 229] to each new strain in complex diseases of this type. Kentucky No. 16 Burley tobacco plants ostensibly 'recovered' from the ring spot stage of infection induced by five of the six strains developed conspicuous foliar chlorosis and necrosis when exposed to a temperature of 20° C., in contrast to the practically normal growth made at 26°, indicating that no real 'recovery' from ring spot as claimed by Price [ibid., xix, p. 487] takes place, the plants merely entering upon a new phase of the disorder [ibid., xiv, p. 402]. All six strains caused pollen sterility, entailing a heavy reduction in the quantity of seed harvested, so that if fertility were the principal criterion of health, a spurious 'recovery' of the kind described would not be recognized. So-called 'recovered' plants, moreover, are not immune from reinfection by a more virulent strain of ring spot. There is no conclusive evidence that infection with one ring spot strain confers immunity from others and the phenomenon is considered to be explicable on the basis of competition between different strains.

Lauffer (M. A.) & Dow (R. B.). **The denaturation of Tobacco mosaic virus at high pressures.**—*J. biol. Chem.*, cxl, 2, pp. 509–518, 1 graph, 1941.

Tobacco mosaic virus nucleoprotein was exposed to pressures between 5,000 and 10,000 kg. per sq. cm. at 30° C., and found to be almost completely inactivated, gauged by the reactions to inoculation of bean (*Phaseolus vulgaris*) leaves, at about 7,500 kg. per sq. cm., a result agreeing with previous observations along the same lines [*R.A.M.*, xvii, p. 562]. At such exposures, varying amounts of an inactive coagulum were formed, the maximum quantity being produced between 6,000 and 8,000 kg. per sq. cm. The coagulum contained only a small amount (0·09 to 0·17 per cent.) of phosphorus, indicating that nucleic acid was liberated in the process of denaturation of the virus at high pressures. Experimental evidence was obtained that the pressure denaturation of the tobacco mosaic virus is a complex reaction.

Foster (H. H.). **Notes on Tobacco diseases in Puerto Rico.**—*Plant Dis. Reptr*, xxv, 8, pp. 238–242, 1941. [Mimeographed.]

The causal organism of black shank, *Phytophthora parasitica* [var.] *nicotianae*, is stated to be the most important pathogen of seed-bed and field tobacco in Puerto Rico [*R.A.M.*, xii, p. 402], infection in a recent varietal test amounting to 94·7 per cent. in the mosaic-resistant No. 34, while the corresponding figures for No. 64 (Venezuela), Pennsylvania Broadleaf, Utuado X No. 1, and Virginia No. 9, and No. 44 (mosaic-resistant) were 75, 34·4, 23·6, and 15 per cent., respectively. On the other hand, 301 from Florida was extremely resistant, only one plant out of 18 contracting infection, while Rg (Florida), Ambalema (Colombia), and Nos. 41, 50, and 54 remained free from attack. No. 41, combining resistance to black shank and mosaic, is a specially promising selection, and the cultivation of No. 44 is also to be continued, but No. 34 has been discarded.

During the past season, a number of superior strains of Ambalema, carrying systemic mosaic infection in a masked form but exhibiting a degree of resistance [ibid., xiv, p. 660] of the class 1 or 2 order [ibid., xvii, p. 629], were selected for further back-crossing with very encouraging results.

The 'mottle' virus reported by Nolla in 1937 (*Rep. Tob. Inst. P.R.*, pp. 23–25), and since observed on several occasions by the writer and others, induces pronounced vein-clearing of the younger leaves 7 to 10 days after inoculation, followed by yellow mottling of the interveinal areas. When developing in conjunction with mosaic, the mottle virus contributes to severe foliar malformation and chlorosis and stunting of the plants.

Ghimpu (V.). **Bolile și insectele dăunătoare Tutunului: Partea I. Partea III.** [Diseases and insects injurious to Tobacco. Part I. Part III.]—*Bult. Cult. Ferment. Tutun.*, xxix, 2 (*Supl.*), pp. 1–80, 1 col. pl., 23 figs., 1940; xxx, 1 (*Supl.*), pp. 253–342, 42 figs., 1941.

This is a fully documented, critical survey of the bacterial, fungal, virus, and physiological diseases affecting seed-bed and field tobacco

in Rumania [*R.A.M.*, xix, p. 307], with explicit directions for their control.

MATSUMOTO (T.). **Serological studies on the distribution and concentration of Tobacco mosaic virus in host plants. I. Measurements of virus after 2–4 days. II. Measurements of virus 5–14 days after inoculation.**—*Trans. nat. Hist. Soc. Formosa*, xxxi, 212, pp. 201–215; 213, pp. 275–285, 1 fig., 2 diags., 1941.

The writer's serological (precipitin) method was found to be applicable to studies on the distribution and relative concentration of the tobacco mosaic virus in its hosts [*R.A.M.*, xv, p. 403; cf. also xvii, p. 124], a fully tabulated description of which is given.

The virus first accumulates in measurable quantities in the inoculated leaf of a young potted tobacco plant two days after inoculation, and then migrates to the top and roots, which are usually reached almost simultaneously [ibid., xii, p. 791; xiii, p. 660; xviii, p. 823], though occasionally migration proceeds only upwards and still less frequently only downwards. On the third day after inoculation a certain amount of virus is detectable in the stem, but not until the fourth does the virus begin to appear in the leaf below the inoculated one. Small quantities of the virus are also found at this stage in the leaves above that inoculated. From the fourth to the seventh day the virus is more abundant in the growing points of the plants than in the inoculated foliage, but during the next week the amount of inoculum in the leaves increases until it equals, or in some cases exceeds, the quantity in the growing points. When the inoculation is made on older leaves there is less increase in the virus content in either the inoculated leaf or those immediately above. The concentration of the virus appears to be slightly higher in the tops than in the roots of infected plants, but the difference is not marked.

KÖHLER (E.). **Desinfektionsversuche an Rohsäften des Tabakmosaik- und des Kartoffel-X-Virus.** [Disinfection experiments on crude juices of the Tobacco mosaic and Potato X virus.]—*Zbl. Bakt.*, Abt. 2, ciii, 18–20, pp. 325–334, 4 graphs, 1941.

In experiments at the Biological Institute, Dahlem, Berlin, to determine the efficacy of various substances as disinfectants against the crude juices of the tobacco mosaic and potato X viruses, 1 per cent. sodium lye and 1 per cent. potash lye were found to destroy almost simultaneously both viruses in high concentrations on the leaves of *Nicotiana glutinosa* and Samson tobacco without appreciable damage to the inoculated tissues, and should be of practical utility to growers, combining economy with safety to man and domestic animals. Trypoflavin, eosin, and erythrosin exerted no inhibitory influence worthy of mention on the two viruses under observation, while their deleterious effects on the treated leaf areas were considerable, especially in the case of Samson; and the action of uranin (fluorescein sodium) was insufficient.

KASSANIS (B.). **Transmission of Tobacco etch viruses by aphides.**—*Ann. appl. Biol.*, xxviii, 3, pp. 238–243, 1941.

The tobacco severe etch virus [*R.A.M.*, xx, p. 500] was transmitted

by *Myzus persicae*, *M. circumflexus*, *Aphis rhamni*, *A. fabae*, and *Macrosiphum gei*. The virus content of sap from mild etch-infected plants was considerably lower than that from plants infected by severe etch, yet both viruses were transmitted to the same extent by *Myzus persicae*. The percentage of infection was greatest when aphids were starved for four hours or more and then fed on the infective plants for two minutes; it was also greatly increased by keeping the starved aphids at a low temperature. Continuous feeding on healthy or diseased plants rendered the vectors less efficient and reduced the period of their infectivity from about three hours to 15 minutes. Allowed short feeding periods of two to three minutes on each plant, one insect may infect up to four plants, but it was observed that an aphid may fail to infect from one to four plants and then infect the next; others transmitted on the first day but not on the second, or on the second but not on the first, and still others on both days. It is suggested that the failure to obtain 100 per cent. infection in transmission tests with single aphids is not due to the inability of individuals to transmit, but possibly to some other unknown factor. The great increase in the percentage of infectivity obtained by using starved insects given a short infective feeding is best explained by the inactivation of the virus by a proteolytic enzyme secreted by the aphids in greater quantity while feeding than while fasting, as suggested by Mrs. M. A. Watson in the case of *Hyoscyamus* virus 3 [ibid., xvii, p. 344].

Sheffield (F[rances] M. L.). **The cytoplasmic and nuclear inclusions associated with severe etch virus.**—*J. R. micr. Soc.*, Ser. III, lxi, 1–2, pp. 30–45, 3 pl., 1941.

The severe etch virus of tobacco [see preceding abstract] was found in the author's studies at the Rothamsted Experimental Station to induce in White Burley tobacco (*Nicotiana glutinosa* and *Hyoscyamus niger* also being used as experimental hosts) two types of intracellular inclusion, viz., cytoplasmic and intranuclear [*R.A.M.*, xix, p. 160], the former being amorphous, consisting of mixtures of proteins with fats and lipoids, and arising from the aggregation of particles which appear in the streaming cytoplasm. They may contain some birefringent particles and give rise to needle-like bodies, 2 to 5 μ in length. Unlike the intranuclear type of inclusion, the cytoplasmic can easily be pricked or divided into portions with a micro-needle. They contain the virus, which is also present, however, in other parts of the cell. The intranuclear inclusions give protein reactions and are more stable than those of the cytoplasmic type. They occur in the form of thin, rectangular, often square plates, with sides measuring up to 10 μ in length, the largest, however, being less than 0·5 μ in thickness; as many as 30 may be accommodated in a single nucleus. Both kinds of inclusion have been found in almost all the plant tissues, including the seed coat in the case of the intranuclear, but the young embryo is free from them. The severe etch virus was experimentally shown not to be transmissible by way of the seed.

The two types of intracellular inclusion are critically discussed in relation to the crystalline bodies observed in normal plants, e.g., dahlia and privet, and in both diseased and healthy plant and animal

tissues. Possibly their function may be that of a reserve substance, the view advanced by Tischler (Allgemeine Pflanzenkaryologie I, Berlin, 1934), while there is also some evidence that they arise from an unbalanced metabolism.

Price (W. C.) & Black (L. M.). **Unrelatedness of Tobacco-streak and Potato yellow-dwarf viruses.**—*Amer. J. Bot.*, xxviii, 7, pp. 594–595, 1 fig., 1941.

In cross-protection tests carried out in an attempt to clarify the relation between the tobacco streak and the potato yellow dwarf viruses [*R.A.M.*, xx, p. 180], artificially infected *Nicotiana rustica* plants showing the chronic stage of tobacco streak failed to develop further symptoms when inoculated with the tobacco streak virus, but when inoculated with the severe strain of potato yellow dwarf virus, or tobacco mosaic, tobacco necrosis, or tobacco ring spot viruses, they developed symptoms characteristic of the given virus. Of the plants affected by the chronic stage of potato yellow dwarf, those inoculated with the severe strain of potato yellow dwarf virus failed to develop further symptoms, while those inoculated with tobacco streak or any of the other three viruses previously used all developed local lesions typical of the virus used as inoculum. These results indicate that plants affected with tobacco streak are not protected against potato yellow dwarf virus, or vice versa, and it is concluded therefrom that the two viruses are not strains of the same virus, and in this sense are unrelated. Furthermore, the other viruses used do not seem to be related to each other.

Hill (A. V.). **Yellow dwarf of Tobacco in Australia. II. Transmission by the Jassid Thamnotettix argentata (Evans).**—*J. Coun. sci. industr. Res. Aust.*, xiv, 3, pp. 181–186, 1941.

Continuing his investigations into tobacco yellow dwarf in Australia [*R.A.M.*, xvii, p. 75; xix, p. 457], the author planted Dungowan and Dungowan Selection seedlings, 30 of each, in a field in Victoria under an insect-proof cover, an equal number being planted just outside the cage. All the covered plants remained healthy, though eight of the 60 controls became affected. Yellow dwarf scions were then top-grafted to 12 apparently healthy plants in the plant house, 12 other plants being topped to the height of the grafted ones. All the grafted plants became affected, while all the ungrafted ones remained healthy. Forty-six days after grafting, the cover was removed, and all the plants were cut off near ground level. The new shoots which developed from the bases of the 12 grafted plants developed yellow dwarf, while those on all the other plants formerly under cover were healthy. The controls were similarly cut off, and symptoms appeared in the new shoots of those visibly diseased when cut back and in two others as well. Next season the experiments were repeated elsewhere on Hickory Pryor seedlings, with similar results.

In insect transmission tests at Shepparton in 1939–40, insects of all species found in affected fields were put in cages (according to species) containing their hosts other than tobacco, and affected and healthy tobacco plants. The apparently healthy tobacco plants were removed

at intervals to an insect-free house, being replaced by other healthy tobacco plants. In all, 173 plants were placed in cages with various insects other than *Thamnotettix argentata* collected from a field where 95 per cent. of the plants later became affected, but none of these plants developed the disease, nor did it appear on any of the 150 plants kept in other, insect-free cages. In three cages in which *T. argentata* was placed, 15 of 53, 14 of 48, and 7 of 29 plants became affected. In another cage, in which all species collected at various times in a tobacco field were placed, 10 of 34 plants became affected. The minimum period for the development of symptoms on plants exposed to *T. argentata* in cages or in the field was 10 days, or about half the time required under greenhouse conditions for transmission by grafting.

Other transmission experiments with this insect were carried out at Canberra in 1940 and again at Shepparton in 1940–1. The disease was transmitted to 121 of 262 plants, whereas several hundred insect-free plants kept under similar conditions remained healthy. Both nymphs and adults of *T. argentata*, particularly those collected in November, transmitted the disease.

Gadd (C. H.) & Loos (C. A.). **A virus disease of Ageratum conyzoides and Tobacco.**—*Trop. Agriculturist*, xcvi, 5, pp. 255–264, 3 pl., 1941.

Some two years ago, the common weed *Ageratum conyzoides* growing on an estate in Ceylon developed a condition in which, seen from the upper surface, the veins of the top leaves appeared as yellow bands narrowing and growing less yellow towards the leaf base. On the under surface the veinbanding was less conspicuous, but the veins were yellow and stood out prominently owing to the interveinal areas being concave. On a few plants the leaf edges were curled downwards and inwards towards the lower surface, and some of these also presented thickenings of the smaller veins on the under surface, about 1 mm. long and arranged haphazard. When this vein-thickening appeared, it affected all the leaves that showed veinbanding.

The disease was experimentally transmitted from five affected to five healthy *A. conyzoides* plants by grafting diseased scions on to the main stems of the healthy plants, the chief resultant symptom being veinbanding.

In further tests, an affected *Ageratum* plant was placed in each of two insect cages, and white flies from tomato plants were introduced into the cages. Next day, three healthy Harrison's Special tobacco plants were put in one cage, and two in the other. After four days more, all the plants were sprayed with an insecticide. Disease symptoms developed on two tobacco plants in one cage and on one in the other. On the first two veinbanding was the dominant feature, but on the third this symptom was only transitory, and the leaves became crinkled and arched, the upper surface being convex, while the veins on the under surface were thickened and produced enations. This plant became stunted.

The authors conclude that the disease is probably caused by at least two viruses transferable to tobacco by white flies, of which one may cause veinbanding, and the other leaf curl with vein-thickenings or enations. The veinbanding symptom does not appear to be the same

as that described by Pal and Pandon as vein-clearing [*R.A.M.*, xvii, p. 74], or by Thung as transparency [ibid., xi, p. 478]. The figures of diseased *Ageratum* leaves published by Pruthi and Samuel [*Indian J. agric. Sci.*, ix, pp. 223–275, 1939] do not show the yellow lines along the veins. The virus responsible for the veinbanding is considered to belong to the tobacco leaf curl group, and is possibly more closely allied to the virus or strain causing transparent veins than to the one which produces vein-thickenings and enations. Apparently, also, the true leaf curl virus may cause the veinbanding symptom to be masked.

The complete eradication of the weed from the vicinity of tobacco is advised.

Kramer (M.) & Silberschmidt (K.). **A 'faixa das nervuras', uma doença de virus do Fumo encontrada no Estado de São Paulo.** ['Veinbanding', a virus disease of Tobacco observed in the State of São Paulo.]—*Arq. Inst. biol., S. Paulo*, xi, 23, pp. 165–188, 3 pl., 1 graph, 1940. [English summary.]

Seven Virginia tobacco plants growing in an experimental plot at the São Paulo (Brazil) Biological Institute were observed, early in February, 1939, to show symptoms closely approximating to those of veinbanding [*R.A.M.*, xv, p. 738] and consisting of pale green, circular lesions, 2 to 5 mm. in diameter, situated between the secondary veins of the middle leaves, especially near the tip; this mottling persisted throughout the growing period and the newly developing foliage bore short, yellow lines, running partially parallel with the veins, while the veins of the middle leaves occasionally presented a generally chlorotic aspect and were traversed by dark, inconspicuous bands.

The disease was transmitted by means of juice inoculations from affected tobacco plants to the Havana, White Burley, Kentucky, Sumatra, and Yellow Rio Grande tobacco varieties, all of which produced more or less characteristic veinbanding symptoms; to *Nicotiana langsdorffii* (faint mottling), and *N. rustica* (mottling and short veinbanding). Similar experiments on *N. glutinosa* and *Datura stramonium* gave negative results, while those obtained with *Solanum nodiflorum* and *Petunia hybrida* were negative or doubtful. The President, Bintje, Eigenheimer, and Bevelander potato varieties contracted infection both through juice inoculations and grafting. President developed dark, necrotic rings and spots on the inoculated foliage, Eigenheimer showed small, circular spots, with pale grey, necrotic centres, on the middle leaves, Bintje contracted marginal chlorotic spotting of the middle leaves followed by mosaic of the new ones, while the initial mosaic of the young Bevelander foliage was succeeded by similar symptoms on the newly developing and middle leaves, accompanied by rugosity of the surface and small, grey, marginal lesions.

At a dilution of 1 in 500 the veinbanding virus was still capable of infecting White Burley tobacco plants but not those of the Havana variety, while negative results were obtained in both cases at 1 in 1,000. The thermal death point appears to be close to 60° C. (ten minutes' exposure), while the longevity of the virus *in vitro* exceeds 48 but does not reach 72 hours. These properties are critically compared with those of virus Y, as described by various American authors, and

of Köhler's potato virus P in Germany [ibid., xvi, p. 702], and considered to fall within the limits of the group constituted by aberrant strains of the former.

PORTE (W. S.) & WALKER (H. B.). **The Pan America Tomato, a new red variety highly resistant to Fusarium wilt.**—*Circ. U.S. Dep. Agric.* 611, 6 pp., 3 figs., 1941.

The Pan America tomato, developed by the Bureau of Plant Industry, United States Department of Agriculture, from a cross between Marglobe and a wild Peruvian Red Currant (*Lycopersicum pimpinellifolium*) selection, has remained almost free from wilt (*Fusarium bulbigenum* var. *lycopersici*) in field and greenhouse trials with virulent strains of the pathogen during the last ten years. The hybrid is reasonably productive, and appears suitable for canning and processing, as well as for marketing fresh. Seed of the new selection has been distributed to the trade and sufficient stocks should be available by 1942 to meet any probable requirements.

SELMAN (I. W.). **The effects of certain mosaic-inducing viruses on the Tomato crop under glass.**—*J. Pomol.*, xix, 1–2, pp. 107–136, 3 pl., 1 plan, 12 graphs, 1941.

A full account is given of experiments at the Cheshunt Research Station on the effect of tobacco virus 1 and of two strains (A15 and A17) of tomato mosaic virus (Bewley) on the growth, flowering, and fruiting of Potentate tomatoes under commercial glasshouse conditions. Cucumber virus 1 was also inoculated successfully into a few plants. The experimental design was a series of replicated plots. The plants were inoculated on 29th March and observations continued until mid-September when the fruit from five trusses had been harvested. On 15th May one control plant showed a virus mottling and by 20th June, when the fifth truss was in bloom, all the control plants showed similar symptoms, so that the experiment compared the results of early and late infection.

The principal results may be summarized as follows. Infection significantly reduced the weekly height increment of the main stem during the early part of the experiment before the controls became infected and induced a small, non-significant reduction in the weekly rate of leaf production during the same period. High partial coefficients were found to exist between the mean number of daylight hours during which the plants were exposed to a temperature of 70° F. or over and the percentage of plants showing a foliar mottle due to the tobacco or tomato mosaic viruses. There were significant reductions in the number of flower buds (trusses two to five) and the number of fruits picked on the early infected plants, on which the percentage of flower buds producing fruits was lowered in all cases. Relative to the controls the yield (from five trusses) was reduced by virus A15, A17, and tobacco virus 1 by 14·7, 22·3, and 20·1 per cent., respectively.

The time of appearance of the symptoms is considered to be a critical one in the metabolism of an infected plant.

Banfield (W. M.). **Distribution by the sap stream of spores of three fungi that induce vascular wilt diseases of Elm.**—*J. agric. Res.*, lxii, 11, pp. 637–681, 9 figs., 1941.

The author describes a series of experiments in which spore suspensions of *Ceratostomella ulmi* [*R.A.M.*, xx, p. 185], *Dothiorella ulmi* [loc. cit.], and *Verticillium dahliae* [cf. ibid., p. 39] were injected into elms (*Ulmus americana* and *U. fulva*). Later, the injected material was investigated by taking sap samples or by tracing discoloured vessels. The results were markedly affected by the season and the site of injection. During the early part of the leafy season, from injections made at stump-level spores of the fungi were found to have reached points near the tops of tall trees in a very short time (from 20 minutes to 48 hours in the case of *C. ulmi*, and 5 and 7 days in the case of *V. dahliae* and *D. ulmi*, respectively). Massive injections of *C. ulmi* 40 ft. above the stump resulted in spores reaching the stump in from 15 to 20 minutes. During the latter half of the leafy season transportation of spores was slower. *C. ulmi* spores were found in the sap of both naturally wilted and inoculated trees in 1936, both at bole and crown levels. During the non-leafy season the movement of spores was very slow, reaching not more than 24 in. above, or 12 ft. and 6 in. below injection sites in the stump, trunk, and terminal shoots, respectively.

Movement of spores from inoculations was still slower, amounting to only a few inches in a week; but after 4 months the spore distribution was very variable, ranging from a foot or two from the site of inoculation to the whole structure of the trees.

Suspensoids were observed to move very quickly through the large vessels, ascending to a maximum of 20 ft. in less than 10 minutes and descending to a maximum of 36 ft. in 6 minutes. It is concluded that the rapid invasion during the leafy season of the bole and crown of the American elm by the three wilt fungi is due to the distribution of their spores in the large vessels of the new annual ring by the sap stream.

Parker (K. G.), Readio (P. A.), Tyler (L. J.), & Collins (D. L.). **Transmission of the Dutch Elm disease pathogen by Scolytus multistriatus and the development of infection.**—*Phytopathology*, xxxi, 7, pp. 657–663, 1941.

In recent experiments at Cornell University, Ithaca, New York, *Ceratostomella ulmi* was obtained in a higher percentage (76·1) from the outer surfaces of adult *Scolytus multistriatus* beetles [*R.A.M.*, xx, p. 324] than from their intestinal tracts (14·3), the number of colonies in potato dextrose agar cultures also being much larger from the former than from the latter source. The pathogen was readily transmitted to healthy potted elm trees by the beetles in the course of their feeding activities and recovered in a viable condition from feeding scars on uninfected trees up to three years after inoculation; on the other hand, the fungus sometimes died in infected trees before systemic invasion was accomplished. Late spring and early summer inoculations were the most successful, little or no infection resulting from those made later in the season.

Brewer (E. G.). **The fight for the Elms. Review of progress made in the campaign against the Dutch Elm disease.**—*Amer. Forests*, xlvii, 1, pp. 22–25, 4 maps, 1941.

During the last 11 years, 60,975 elms attacked by the Dutch elm disease fungus [*Ceratostomella ulmi*] are stated to have been located, the maximum number for any one year (18,152) having been found in 1938, followed by 10,786 in 1939 and 3,931 up to 30th September, 1940 [*R.A.M.*, xx, p. 139]. The major region of infection has been extended from 2,464 sq. miles in 1934 to 10,000 sq. miles in 1940, while an additional number of isolated foci have been observed. However, an analysis of the results of scouting in 1940 shows that only one elm per 4,000 is diseased in New Jersey, the corresponding figures for Connecticut, New York, and Pennsylvania being one in 13,000, 16,000, and 19,000, respectively. In the course of sanitation work organized by the Department of Agriculture from 1933 to 1940, among other operations, 4,250,000 elms have been removed, material infested by beetle [*Scolytus*] has been excised from 250,000, and nearly 700,000 trees have been chemically destroyed. Since its inception the co-operative effort to eradicate the Dutch elm disease has been financed to the extent of $2,400,000 by the Department of Agriculture, $1,380,000 having been appropriated by the several States involved, and regular instalments totalling nearly $20,000,000 provided through the agency of emergency relief organizations.

Ito (S.) & Akatsuka (K.). **Twig blight of dwarf Elm tree.**—*J. Soc. Agric. For. Sapporo*, xxxii, 157, pp. 55–62, 2 pl., 1940. [Japanese, with English summary. Abs. in *Biol. Abstr.*, xv, 7, p. 1431, 1941.]

Some years ago twig blight of the dwarf elm (*Ulmus pumila*), a species introduced into the Sapporo district of Japan from Manchukuo in 1918, became so prevalent and severe as to kill the trees in patches and necessitate the renovation of the hedges for which they are chiefly used. The causal organism of the disease is apparently identical with *Thyrostroma compactum*, reported on *U. campestris* and *U. pumila* from Europe and the United States, respectively [and also from Canada: *R.A.M.*, xvii, p. 797]. Under local conditions the virulence of the pathogen is probably aggravated by the heavy pruning, insect injuries, and dense planting incidental to the mode of cultivation practised. Good control was obtained in three consecutive seasons by the excision of diseased twigs and sterilization of the cut surface with mercuric chloride solution.

Brown (Nellie A.). **Tumors on Elm and Maple trees.**—*Phytopathology*, xxxi, 6, pp. 541–548, 3 figs., 1941.

A species of *Phomopsis* with α and β spores was isolated from dark, flat, nodular outgrowths, simulating those of crown gall (*Bacterium tumefaciens*), on American elms (*Ulmus americana*), and from the smooth, later rough, cankerous excrescences on maples (chiefly *Acer rubrum* and *A. saccharum*) in various parts of the United States [cf. *R.A.M.*, xvii, p. 779]. None of the diseased tissues yielded *Bact. tumefaciens*. The isolate from elm was inoculated with positive results into its own host, privet (*Ligustrum vulgare*), jasmine (*Jasminum*

nudiflorum), and *Viburnum opulus*; growth was very slow, however, over five years being requisite, for instance, for the development of tumours 1½ in. in diameter on privet stems. In inoculation tests on elms with the peach strain of *Bact. tumefaciens* and the *Phomopsis*, 2 per cent. of 49 were successful with the former and 55 out of 106 with the latter. Moisture appears to be a necessary condition for the establishment of the *Phomopsis* in its hosts, and close planting, which helps to maintain a humid atmosphere, should be avoided where attacks are to be feared.

Marshall (R. P.). **Black spot fungus of Elm (Gnomonia ulmea (Schw.) Thuem.).**—*Tree Pest Leafl.* 41, 4 pp., 2 figs., 1940.

This is a semi-popular note on black spot (*Gnomonia ulmea*), stated to be the most prevalent leaf spot of the American elm (*Ulmus americana*) [*R.A.M.*, xix, pp. 338, 442], other species attacked being *U. fulva*, *U. alata*, *U. crassifolia*, *U. racemosa*, *U. pumila*, and *U. serotina*. The control of the disease in nurseries and on valuable shade trees should be based on the destruction of diseased material and spraying [ibid., xiii, p. 407]. Mention is made of two other fungi causing leaf diseases of elms, viz., *Gloeosporium inconspicuum* and *G. ulmicolum* [loc. cit.].

Diller (J. D.). **Asiatic Chestnuts as forest trees.**—*Amer. Forests*, xlvi, 1, pp. 19–21, 48, 3 figs., 1940.

This is an account of the position to date in the United States with regard to the campaign for the replacement of the native American chestnut (*Castanea dentata*), which is rapidly being decimated by blight (*Endothia parasitica*) [*R.A.M.*, xx, p. 140], by the resistant Japanese and Chinese species (*C. crenata* and *C. mollissima*, respectively). From 1927 to 1930 an expedition organized by the Bureau of Plant Industry explored the forests of Japan (including Korea and Formosa) for suitable material, and obtained about 250 bushels of seed from native strains. At the same time arrangements were made for subsequent consignments of nuts from Japan and China. The imported seed was planted in the Bureau's Maryland nursery, and from 1930 onwards seedlings have been distributed annually to Federal, State, and public agencies, the total number thus supplied for forest plantings from the New England States to Iowa and south to Florida and Texas being 275,000. The Asiatic chestnuts are somewhat exacting in respect of soil requirements, the 'yellow poplar' type of the central forest region of the eastern United States and the 'second bottoms', 'beech hills', or 'river terraces' of the Atlantic and Gulf coastal plain being well adapted to their growth and development. Protected sites facing north should be selected wherever possible.

Walter (J. M.). **Your shade trees. Watch your Sycamores.**—*Amer. Forests*, xlvi, 4, pp. 182–183, 188, 2 figs., 1940.

A popular account is given of the *Ceratostomella* disease of London planes (*Platanus acerifolia*) [*R.A.M.*, xix, pp. 501, 625], of which some 10,000 are stated to have succumbed in Philadelphia and neighbouring New Jersey cities directly across the Delaware River, and 1,000 at Baltimore, while from one to fifty infected trees are known to be

present in the Newark district of New Jersey and certain areas of Virginia, West Virginia, Delaware, Washington, D.C., North Carolina, and Mississippi. To date the cost of replacing dead by new trees in the affected regions is estimated at $400,000. The foliar symptoms of wilting, yellowing, and premature shedding do not appear until the characteristic elongated cankers on the trunks and branches and the reddish-brown to bluish-black discoloration of the underlying wood are well established. The latter feature is most pronounced in the medullary rays, where cross-sections frequently reveal wedge-shaped sectors. During the first year of invasion the cankers, though measuring 20 to 40 by under 2 in., are often indistinct and thus escape attention; they widen irregularly and coalesce, finally girdling the branch or trunk on which they occur, a period of three to five years being requisite for this process in the case of a stem 1 ft. in diameter. The dead bark darkens, dries, cracks, and sloughs off, and during rainy periods numerous spores are produced on the freshly exposed wood surface.

Infection may be spread by means of pruning saws. In July, 1939, pruning cuts were made with saws washed in alcohol and subsequently used on diseased wood, and by the following November 36 per cent. of the wounds had become infected, whereas similar cuts made with clean saws remained healthy. Infection may occur high up in the crown as well as on the trunk. Of 45 branch infections studied up to the present, 26 were associated with pruning cuts, 8 with injuries made by climbers' boots, 3 with accidental saw scratches, 2 each with rope burns and dead spurs, and one with a break due to wind, leaving only three with no definite history of a predisposing injury.

Field observations during 1939 indicated that the asphaltum wound dressings, as ordinarily applied, are not absolutely effective against the plane *Ceratostomella*, while the common practice of allowing contaminated sawdust to fall into the wound dressing cans is a frequent source of re-infection when the brush is dipped into the container prior to the treatment of fresh injuries.

WATERMAN (ALMA M.). **Sycamore and Oak Anthracnose. Gnomonia veneta (Sacc. & Speg.) Kleb.**—*Tree Pest Leaft.* 48, 4 pp., 5 figs., 1940.

The hosts of *Gnomonia veneta* [*R.A.M.*, xx, p. 183] in the United States are *Platanus occidentalis*, *P. acerifolia*, *P. orientalis*, *Quercus alba*, *Q. bicolor*, *Q. coccinea*, *Q. velutina*, *Q. borealis* [var.] *maxima*, *Q. rubra*, and (occasionally) *Q. palustris*, *Q. prinus*, and *Q. macrocarpa*. The summer leaf and twig stages of the fungus on *Platanus* are known as *Gloeosporium nervisequum* and *Discula platani* [ibid., xix, p. 444] or *Myxosporium valsoideum*, respectively, and similar stages occur on oaks. Control may be effected (where the value of the trees warrants the expense) by three applications of 4–4–50 Bordeaux mixture (1) in the early spring to prevent infection of the newly developing buds, and (2) and (3) at 10- to 14-day intervals to protect the leaves as they are formed. The excision and burning of diseased material and the sterilization of pruning implements are also advocated.

Toole (E. C.). **Fusarium wilt of the Mimosa tree (Albizzia julibrissin).** —*Phytopathology*, xxxi, 7, pp. 599–616, 1 fig., 2 graphs, 1941.

The following information, supplementing Hepting's observations, is presented concerning the vascular wilt of the mimosa tree (*Albizzia julibrissin*) in the United States, where centres of infection by *Fusarium perniciosum* have been detected in Virginia, South Carolina, and Georgia in addition to the previous report from North Carolina [*R.A.M.*, xix, p. 313].

The numerous isolates of the pathogen studied fell into three cultural groups based on their growth characters on various standard solid and liquid media, viz., (1) appressed with slimy mats and occasionally tufts of cottony, vinaceous-purple to white aerial mycelium (non-virulent in soil inoculation experiments), (2) raised mycelial, felty to cottony, purple (highly virulent), and (3) raised sclerotial, woolly, with occasional sporodochia (moderately virulent) [cf. ibid., xx, p. 92]. The results of water culture inoculations did not altogether agree with those of the soil inoculations, all three types producing more extensive wilting in the former than in the latter series, though the appressed group again gave the lowest percentage (60 compared with 75 and 82 for the raised sclerotial and raised mycelial, respectively). Saltation occurred in all three cultural classes.

Besides *A. julibrissin*, *A. lebbek* and *A. lophantha* were found to be susceptible to infection by *F. perniciosum*, the former being more, and the latter less, resistant than the original host to a highly pathogenic strain of the fungus.

F. perniciosum spreads on or through the soil, gaining ingress to the mimosa roots through the epidermis or root hairs, and traverses the cortex to the vascular system, the proper functioning of which is impeded, with the result that the foliage wilts and the plant dies. With the decay of the roots, the pathogen is once more released into the soil. The minimum, optimum, and maximum temperatures for the growth of *F. perniciosum* in culture are below 10°, about 25°, and just above 35° C., respectively.

Fisher (P. L.). **Germination reduction and radicle decay of conifers caused by certain fungi.**—*J. agric. Res.*, lxii, 2, pp. 87–95, 1941.

A number of organisms were isolated from surface-sterilized fresh and stratified coniferous seeds and seeds taken from nursery beds in which germination had failed, *Fusarium* spp. and various bacteria being the most frequent. Tested in inoculation experiments conducted at temperatures from 32° to 77° F., the following isolates caused radicle decay in *Pinus resinosa*, *P. ponderosa*, and *P. banksiana*: *Botrytis* (*?cinerea*), *Fusarium* spp., an unidentified Phycomycete, *Pythium de Baryanum*, *P. ultimum*, *Rhizoctonia* sp., *Verticillium* sp., *Sphaeropsis ellisii* [*Diplodia pinea*], and four unidentified fungi. *Aspergillus niger*, *Cylindrocladium* sp., *Penicillium* sp., *Pestalozzia* sp., plaster mould, and two unidentified fungi did not cause a consistent loss of radicles. *Alternaria brassicae* var. *microspora*, *Chaetomium globosum*, *Rhizopus circinans*, *R. oryzae*, *R.* sp., *Mucor* sp., *Thielavia* sp., and one unidentified fungus failed to attack the radicles, though

a general decrease in the percentage of germination occurred in practically all inoculated series, even when there was no visible radicle or seed decay. Temperature was found to exert a marked influence on the rate of germination: at 32° to 60° germination was delayed and spread out over about three months, while at 77° it was completed in approximately 30 days. There was no significant difference in the susceptibility of the hosts under the conditions of the experiment.

HEDGCOCK (G. G.). **Notes on Coleosporium jonesii (Pk.) Arthur.**—*Plant Dis. Reptr*, xxv, 8, pp. 244–249, 1941. [Mimeographed.]

Coleosporium jonesii, synonyms of which, according to Arthur [*R.A.M.*, xiii, p. 728], are *Uredo ribicola* C. & E. non Lasch, *U. jonesii* Pk, *C. ribicola* Arth. [ibid., ii, p. 348], and *Peridermium ribicola* Long, has long been known as a Rocky Mountain rust, but of late years its range has been extended to Minnesota, Washington, and Wisconsin. Its aecidial host, *Pinus edulis*, is most abundant in Colorado, where the fungus is epidemic on wild currants and gooseberries up to an altitude of 9,000 ft. above sea-level. *Ribes inebrians* and other native species, except *R. americanum*, which is rarely infected, are the chief alternate hosts of the rusts, cultivated gooseberries being rarely attacked and garden red currants apparently immune. *C. jonesii* differs from *Cronartium ribicola* and *C. occidentale* in its large caeomoid uredosori, while its teleutosori lack the hair-like structure of species of *Cronartium*. Four other rusts attacking *Ribes*, viz., *Melampsora ribesii-purpureae* Kleb., an undescribed *M.* sp., *Puccinia caricis-grossulariata* Arth., and *P. parkerae* Diet. & Holw., form no alternate stage on pine.

Inoculation experiments from 1917 to 1922 with aecidiospores of *Coleosporium jonesii* from *Pinus edulis* resulted in the infection of *R. aureum*, *R. grossularia*, *R. hirtellum*, *R. inebrians*, *R. inerme*, *R. innominatum* = *R. grossularia* × *divaricatum*, *R. missouriense*, *R. nigrum*, *R. odoratum*, and *R. sativum*. In tests with uredospores from *Ribes* from 1917 to 1924 positive infections were obtained on 16 species of *Ribes*. From 1916 to 1924 sporidia from teleutospores of *C. jonesii* from *Ribes* twigs were inoculated into 26 *Pinus* spp. with positive results on *P. edulis* and *P. pinea* only. In addition to the 23 species of *Ribes* found naturally infected in the United States *R. divaricatum*, *R. nigrum*, and seven other species were proved susceptible in inoculation experiments at Washington, D.C.

The uredospores of *C. jonesii* from 16 species of *Ribes* averaged 18 to 30 by 15 to 24 (mean 23 by 19·4) μ, compared with 21 to 32 by 17 to 25 (26 by 20) μ for those of the most nearly allied species, *C. ipomoeae* [ibid., xix, p. 126].

FRIES (N.) & JONASSON (LISBETH). **Über die Interfertilität verschiedener Stämme von Polyporus abietinus (Dicks.) Fr.** [On the interfertility of various strains of *Polyporus abietinus* (Dicks.) Fr.]—*Svensk bot. Tidskr.*, xxxv, 2, pp. 177–193, 5 diags., 3 maps, 1941.

Fourteen fruit bodies of *Polyporus* [*Polystictus*] *abietinus* from spruce and pine wood in various localities of eastern and western Sweden were examined at the University of Upsala in April, 1941, from the standpoint of interfertility relationships. All the five fructifications subjected

to a complete analysis of sexuality were tetrapolar. All possible combinations of two monosporous mycelia from each of the 14 fruit bodies were made. Only nine combinations proved sterile, indicating that the fruit bodies of *P. abietinus* are not, as was expected, genotypically completely different as regards the genes controlling tetrapolarity but that some of these genes were common to several fructifications. The cells of the haploid mycelia are uni-, and those of the diploid mycelia binuclear. The diameter of the diploid hyphae exceeded that of the haploid by some 35 per cent., and the former also surpassed the latter in velocity of growth.

Boyce (J. S.). **Needle cast disease of Pines (Bifusella, Hypoderma, Hypodermella, Lophodermium).**—*Tree Pest Leafl.* 44, 4 pp., 1 fig., 1940.

A semi-popular account is given of the symptoms of needle cast of pines in New England and the life-history of its causal organisms, *Lophodermium pinastri* [*R.A.M.*, xviii, p. 360], *L. nitens*, *Hypodermella ampla*, *Hypoderma lethale*, *H. desmazierii* [ibid., xii, p. 667], and *Bifusella linearis*. Control by spraying is necessary and practicable only in nurseries.

Hansbrough (J. R.). **The Sweetfern blister rust of Pitch Pines (Cronartium comptoniae Arth.)**—*Tree Pest Leafl.* 45, 4 pp., 7 figs., 1940.

This is a semi-popular account of *Cronartium comptoniae*, the cause of heavy damage to a number of pines of the pitch or hard group in the United States [*R.A.M.*, xvii, p. 360], those sustaining the most severe injury in forest nurseries and young plantings being *Pinus ponderosa* and *P. contorta* in the Lake States and *P. sylvestris* and *P. taeda* in the north-east.

Ezekiel (W. N.) & Nelson (C.). **Sclerotial seedling blight of Black Walnut.**—*Plant Dis. Reptr*, xxv, 12, pp. 336–337, 1941. [Mimeographed.]

On 22nd May, 1941, black walnut (*Juglans nigra*) seedlings about 3 weeks old and 6 in. high in a nursery bed near Alto, Texas, were found to be dying, apparently as a result of infection by *Sclerotium rolfsii*. By 6th June, most of the plants were dead, 100 or so isolated seedlings scattered throughout a long bed having been killed. Not more than two or three affected plants were found in any one place; usually only a single plant, representing, apparently, an initial infection, had been attacked. Every diseased plant examined showed *S. rolfsii* strands and typical small sclerotia over the crown, and frequently over the large parent nuts still attached to the plants and situated 1 to 3 cm. below soil-level. The fungus appeared to be spreading from some of the seedlings in centrifugal white fans less than 1 cm. below the soil surface. Sclerotia were noted in these fans. Placed in a damp chamber, affected material developed yellowish-white to light buff to dull brown sclerotia, 0·8 to 1·1 mm. in diameter. This appears to be the first record of the fungus on *Juglans*. Infection was favoured by the artificial irrigation practised in the nursery and an exceptionally wet season.

Friese (W.). **Chemistry of true dry rot.**—*Pharm. Zentralh.*, lxxxii, pp. 217–224, 1941. [German. Abs. in *Chem. Abstr.*, xxxv, 17, p. 5928, 1941.]

The water content of the mycelium of the dry rot fungus, *Merulius lacrymans*, is stated to vary widely. The 'tears' contain an organic dyestuff and have an average P_H of 3·32. The iron content of the fungus is very variable, whereas that of manganese is constant. The ash is very rich in potash and orthophosphoric acid. Silica was detected in mycelium growing over sandstone. Only minute amounts of tannin occurred in the fungus growing on oak. The spores of *M. lacrymans* yielded 15 per cent. of an oil with n 1·4741.

Fisher (R. C.). **Studies of the biology of the death-watch beetle, Xestobium rufovillosum de G. IV. The effect of type and extent of fungal decay in timber upon the rate of development of the insect.**—*Ann. appl. Biol.*, xxviii, 3, pp. 244–260, 2 graphs, 1941.

In continued studies at Princes Risborough [*R.A.M.*, xx, p. 140], the rate of development of the death-watch beetle, *Xestobium rufovillosum*, was studied in English oak sapwood (*Quercus robur*) decayed by *Phellinus cryptarum* (a white rot) and *Coniophora cerebella* [*C. puteana*] (a brown rot), and willow decayed by *Polystictus versicolor* (a white rot). The results showed that sound timber is unsuitable for infestation by first-stage larvae of the insect. The rate of boring and the development of the larvae increased with the increasing extent of decay in wood, in which they were living. By plotting the average minimum duration of the life-cycle of the insect against the extent of decay, it was evident that a decrease in the former is associated with an increase in the latter, both in the white and brown rot types. The effect of the fungus was most pronounced at the lower end of the decay scale, and little further effect was apparent when the extent of decay exceeded 45 per cent. in oak or 27 per cent. in willow.

Airola (E. V.). **Eräs märän paperimassan homevahinkojen vastustamiskeino.** [A method for the control of fungal damage to wet pulp.]—*Papp. Trävarutidskr. Finl.*, xxiii, 7a, pp. 112–114, 116–118, 120–122, 124, 126, 128–129, 10 figs., 2 graphs, 1941. [German summary.]

Following a brief survey of the methods hitherto practised against fungal damage to wet groundwood and chemical pulp, viz., treatment with chemicals, heat, and antagonistic micro-organisms [*R.A.M.*, xvi, p. 575], the writer describes a new Finnish mode of attack based on the reduction of air inside the bale by pressure to a degree which no longer suffices for the development of the agents of decay. The results obtained in experiments, in which sterilized mechanical and chemical pulp suspensions were inoculated with *Pullularia pullulans* [ibid., xviii, p. 774; xix, p. 634], showed that the pulp should be very thoroughly infected at the outset, so that the air remaining inside the bale is soon consumed and further development of the spores arrested. With slight initial infection, on the other hand, a comparatively large amount of air is available for each spore and growth proceeds without opposition. Under conditions of high initial infection (300,000 to 400,000

spores per gm.) a pressure of 10 kg. per sq. cm. was found to suffice for the control of the fungi in ground wood pulp, the corresponding figure for chemically prepared material being 15 kg. Much higher pressures are necessary for slight infection. The elimination of the mould was limited to the inside of the bales, the outside edges in contact with the air showing a profuse development. Similar results were obtained in tests with the causal organisms of red and brown rot [loc. cit.]. Frozen pulp being particularly susceptible to fungal damage, a series of tests was conducted with infected and pressed bales which were then allowed to freeze. No appreciable difference, as regards facility of control, was observed between the frozen and non-frozen pulp.

Lynch (P. B.). **Control of 'brown heart' of Turnips and Swedes.**—*N.Z.J. Agric.*, lxiii, 2, pp. 109–112, 2 figs., 2 graphs, 1941.

Further experiments in New Zealand during the past three years on the control of brown heart of swedes and turnips [*R.A.M.*, xix, p. 182] showed that no compound of boron tested, including 'rasorite' (a more concentrated form of borax), calcium borate, recrystallized borax (in large crystals), various pellets of bentonite and borax, and different mixtures of borax with fertilizers, applied at various rates at sowing, controlled the disease without adversely affecting germination. Increasing the seeding rate per acre when drilling with borax in contact with the seed gave more plants per acre, while lighter seedings sometimes resulted in higher percentage germination, though such increases were not large enough to compensate for the smaller number of seeds sown. Severity of germination injury was directly related to the amount of borax coming into contact with the seed. The most successful treatments were broadcasting and application in bands 1 to 1½ in. to the side of the seed in the drill; in the absence of suitable implements broadcasting is advised. Injury to germination was greatest in dry seasons, but heavy rain after an application appeared to leach the borax through the soil. Borax applications made even as late as the rough-leaf stage gave satisfactory results. The Vilmorin and Wilhelmsburger swede varieties appeared to be somewhat more resistant to brown heart than Superlative and Sensation.

In conclusion, it is recommended that 40 lb. of borax per acre should be broadcast before or soon after sowing. If heavy rain follows, the top-dressing should be repeated. Heavy rather than light rates of seeding should be used, and where infection is severe, Wilhelmsburger and Vilmorin swedes may be planted.

Kalchschmid (W.). **Krankheiten an Kohlgewächsen und ihre Bekämpfung.** [*Brassica* diseases and their control.]—*Dtsch. landw. Pr.*, lxviii, 21, pp. 185–186, 4 figs., 1941.

The only fungal disease discussed in this article on the disorders of *Brassica* crops in the Bayreuth district of Germany is club root (*Plasmodiophora brassicae*), for the control of which the following measures are recommended: (*a*) in the seed-bed; quadrennial to quinquennial crop rotation, or if this is impracticable, soil sterilization with unoiled calcium cyanamide, superphosphate, and 40 per cent. potash

[*R.A.M.*, vii, p. 691] at the rates of 100, 50, 50 gm. per sq. m., respectively, 14 days before planting, or for small areas brassisan [ibid., xx, p. 146] (50 gm. per sq. m., mixed with dry sand and incorporated at a depth of 5 to 10 cm.): (*b*) in the field; immersion of the seedlings before transplanting in a mixture of 2·5 gm. uspulun, 25 gm. solbar, and 1 l. water, converted into an emulsion by the admixture of loam; substitution of mineral fertilizers for organic manure in plots suspected of harbouring the pathogen; crop rotation or soil sterilization as described above; and thorough sanitation.

Wenzl (H.). **Mykologische und ökologische Studien über die Blattbräune der Rübe. Gibt es ein Sporodesmium putrefaciens als Erreger der Blattbräune?** [Mycological and ecological studies on Beet leaf browning. Is there a *Sporodesmium putrefaciens* as the agent of leaf browning?]—*Zbl. Bakt.*, Abt. 2, ciii, 18–20, pp. 335–347, 2 figs., 1 graph, 1941.

Previous investigations by Pierrette C. Bolle [*R.A.M.*, iv, p. 60] and A. Wenzel [ibid., xi, p. 147] have already shown that the familiar and widespread leaf browning of beets is not a virulent disease, the fungi on the affected foliage being merely facultative pathogens.

An exceptionally severe outbreak of the trouble in 15 beet-growing districts of the Danube Valley (mostly the lower reaches) in July and August, 1939, afforded an abundance of material for examination, which was carried out *in situ*, in the moist chamber, and in onion decoction-saccharose-peptone agar cultures. The predominating fungus in all the specimens was identified as *Alternaria tenuis* [ibid., xix, p. 319], the conidia of which measured 22 to 88 by 9 to 22 (mean 41 by 12·5) μ and 13 to 72 by 7 to 20 (28 by 12) μ in the moist chamber and in culture, respectively, while those developing in nature were mostly 50 to 80, occasionally up to 120 μ in length and 15 to 17 μ in width. The presence of *A. cheiranthi* (Fr.) Bolle [ibid., xvi, p. 482] in the diseased material could not be established with certainty, and the writer is of opinion that it is not concerned in the pathogenesis of leaf browning. Frequent concomitants of *A. tenuis* were *Cladosporium herbarum* and *Macrosporium* (probably *M. sarcinula* [*Stemphylium botryosum*]). *Sporodesmium putrefaciens* [ibid., xv, p. 549] does not enter into the picture at all, and its reputed association with the leaf browning is attributable to confusion on the part of Frank (1896), who interpreted the *Alternaria* and *Cladosporium* conidia as stages in the life-history of a single fungus, *S. putrefaciens*.

Differences in the incidence of leaf browning in an alluvial soil at Ober-Siebenbrunn, east of Vienna, at intervals of a few metres were found to be due to the texture of the subsoil, diseased plants being observed in four places where broken stones occurred at levels of 30, 35, 55, and 65 cm., whereas in four other sites supporting healthy beets the chippings were only found at depths of 100, 120, 125, and below 130 cm., respectively. These observations point to drought as a predisposing factor in the development of the disorder, for the control of which no measures have yet been devised, since the underlying climatic and edaphic factors are scarcely susceptible of modification.

Sanford (G. B.). **Pathogenicity tests on Sugar Beets of random isolates of Rhizoctonia solani Kühn from Potato.**—*Sci. Agric.*, xxi, 12, pp. 746–749, 1 fig., 1941.

In three years' pathogenicity trials in Alberta, in which 148 isolates of *Rhizoctonia* [*Corticium*] *solani* obtained from sclerotia on potato tubers, from lesions on potato stems, and from basidiospores of the *Corticium* stage on potato stems [cf. *R.A.M.*, xvii, p. 481; xx, p. 175] were tested on large sugar beets in the field (by placing inoculum approximately 3½ in. below ground-level, next to each of 10 large, unwounded roots), none of the isolates showed any ability to infect the beets. All the sugar beet controls similarly inoculated, however, with three isolates obtained from, and virulent to, that host, were killed each year within 20 days at average soil temperature of 12° and 15° C. [cf. ibid., xix, p. 59]. It is evident, therefore, that the sugar beet pathogen would be capable of causing severe damage to that crop in Alberta, but whether strains pathogenic only to sugar beet might be harboured or increased by a potato crop remains unknown.

Coons (G. H.), Stewart (D. E.), & Gaskill (J. O.). **A new leaf-spot resistant Beet variety.**—*Sugar*, xxxvi, 7, pp. 30–33, 2 figs., 1941.

A tabulated account is given of the experimental work at the Division of Sugar Plant Investigations, Bureau of Plant Industry, United States Department of Agriculture, which has culminated in the release of a new sugar beet variety, U.S. 215×216, resistant to leaf spot (*Cercospora*) [*beticola*] and superior to the earlier introduction, U.S. 200×215 [*R.A.M.*, xx, p. 286], now widely grown in eastern districts and to some extent also in the irrigated lands east of the Rocky Mountains. U.S. 216, which replaces 200 in the new hybrid, excels in root yield, sucrose percentage, and leaf spot resistance, while U.S. 215 also withstands the disease better than European varieties, and both are equal to the latter in their acre yields of sugar.

Stoker (G. L.) & Tolman (B.). **Boron deficiency relations in Sugar Beets grown for seed in Oregon.**—*J. Amer. Soc. Agron.*, xxxiii, 7, pp. 657–665, 4 figs., 1941.

Boron deficiency of sugar beets [*R.A.M.*, xx, p. 518] grown for seed in western Oregon is initially expressed by dwarfing of the seed-stalk and an abnormally dark green coloration of the foliage and developing inflorescence, and is characterized in subsequent phases by distortion and darkening of the upper part of the central seed-stalk and the discoloration and death of some or all of the lateral floral shoots, and often by partial recovery, with a witches' broom type of inflorescence of the multiple second-growth shoots. The disease was found to be controllable by the application of borax at the rate of 30 lb. per acre. Henceforth this treatment (25 to 35 lb. per acre) will constitute a regular part of the fertilizer schedule to be followed in the affected areas.

Davey (A. E.) & Leach (L. D.). **Experiments with fungicides for use against Sclerotium rolfsii on soils.**—*Hilgardia*, xiii, 10, pp. 523–547, 1941.

Sclerotium rolfsii, the agent of southern sclerotial rot of sugar beets

in the Sacramento Valley of California [*R.A.M.*, xx, p. 508], has been found to grow on media with a wide range of hydrogen-ion concentrations (P_H 2 to 8) [ibid., vii, p. 48], while in the field the incidence of the disease does not vary appreciably with the soil reaction up to P_H 8. Moderate applications of lime to the soil have caused only a slight reduction of infection. None of the 17 water-soluble chemicals and fungicides tested in the laboratory, and for the most part in the field also, proved more effective than formaldehyde under all conditions, though several, including ammonia [ibid., xv, p. 194], were more potent *in vitro*. In field tests, with one exception, formalin (37 per cent. formaldehyde, diluted 1 : 100 and applied at the rate of 3 gals. per sq. ft. of soil surface), destroyed the sclerotia to a depth of 6 in., whereas ammonia (28 per cent. NH_3) and sodium hydroxide at the same concentrations and rates failed to cause any considerable diminution in the amount of inoculum. The timely removal of diseased beets from infested fields, combined with chemical treatment of the surrounding soil, reduced the incidence of *S. rolfsii* in the same row only. Of the five volatile, non-water-soluble fungicides tested, xylene, tetrachlorethane, and pentachlorethane failed to kill the sclerotia even at the maximum doses of 5,000 parts per million of soil under humid conditions, whereas chloropicrin and carbon disulphide were toxic at rates as low as 100 and 600 p.p.m. of soil, respectively. When properly confined (a matter of some difficulty), 2 c.c. chloropicrin per sq. ft., injected at a depth of 6 in., sufficed to kill the sclerotia to a depth of 1 ft. in the experimental plots of Columbia silty clay loam. Some 97 per cent. of the sclerotia in the surface zones of piles of screenings at beet receiving stations succumbed to the effect of the fumigant. Such screenings are now piled on non-agricultural land presenting no menace to cropped land and not returned to each grower's truck as was formerly done, the necessity for using fungicides being thereby avoided.

Dundas (B.). **Further studies on the resistance to powdery mildew of Beans.**—*Hilgardia*, xiii, 10, pp. 551–565, 1941.

In further studies at the California Agricultural Experiment Station on the reaction to powdery mildew (*Erysiphe polygoni*), the strain used now being designated strain 1, of the F_1, F_2, and F_3 generations of crosses between resistant and susceptible bean varieties [*R.A.M.*, xx, p. 43], the tests were made on detached leaves supported on cotton in a 10 per cent. sucrose solution in Petri dishes as before described [ibid., xvi, p. 363] and in addition for certain F_3 generations field inoculation was used. The varieties Striped Hopi, Lady Washington, Hungarian, Yellow, Long Kidney, *Phaseolus vulgaris* 5053, and Pinto were found to be resistant at all stages of growth, while Pink was susceptible in the initial phase but acquired resistance with advancing maturity. Robust, Small White, Kotenashi, and Red Kidney were susceptible, while Long Roman was semi-resistant in the field but susceptible in dish tests.

The F_1 and F_2 of Robust × Striped Hopi and its reciprocal cross were tested by the dish method, and the F_3 of the former by field inoculation also. The F_2 segregated in a ratio of three resistant to one susceptible,

showing resistance to mildew to be due to a single dominant Mendelian factor pair. Similar results were obtained in crosses of Lady Washington × Small White, Long Roman × Lady Washington, Robust × Hungarian, Long Roman × Hungarian and its reciprocal cross, Yellow × Long Roman, Robust × Yellow, *P. vulgaris* 5053 × Red Kidney, Long Kidney × Red Kidney, Robust × Pink, and Pink × Kotenashi.

In crosses between resistant varieties, the F_1, F_2, and F_3 generations from Lady Washington × Pinto, Hungarian × Pinto, Yellow × Pinto, *P. vulgaris* 5053 × Pinto, Pinto × Striped Hopi, Long Kidney × Pinto, Pinto × Pink, and the F_1 and F_2 from Yellow × Hungarian and Yellow × *P. vulgaris* 5053 were all resistant, denoting that these varieties carry the same single Mendelian factor for resistance to mildew.

JENKINS (W. A.). **A histological study of Snap Bean tissues affected with black root.**—*J. agric. Res.*, lxii, 11, pp. 683–690, 4 pl., 1941.

In a histological study of snap beans (*Phaseolus vulgaris*) affected with black root, a virus disease reported from Georgia in a previous paper by the same author [*R.A.M.*, xix, p. 515], fresh and fixed material of several bean varieties and progenies from segregating hybrids was examined by staining with various dyes of which Pianese III b, alcoholic safranin counter-stained with light green in clove oil, and Heidenhain's iron-alum haematoxylin proved the most suitable. It was found that the external symptoms exhibited by the roots, hypocotyls, stems, and pods of diseased plants are correlated with a necrosis of the phloem, cambium, and outermost layer of xylem of these parts. The necrotic symptoms in the phloem cells ranged from slight cytoplasmic disorganization to more or less complete destruction of the cytoplasm and nucleus, the cell contents finally resembling gum and the cellulose walls becoming covered by deposits of suberin. Furthermore, sieve-tubes showing early symptoms were found plugged by callose pads. In the cambium, areas adjacent to the phloem showed the same condition as that prevailing in the phloem, while areas nearest to xylem were affected similarly to the xylem, in which few symptoms developed except in the ray parenchyma and the xylem parenchyma around the youngest scalariform vessels nearest the cambium; severe necrosis was occasionally found in these layers of the xylem. In the vessels of the xylem only very exceptional cases of plugging were observed and very few tyloses were seen.

It is tentatively suggested that the sudden wilting of bean plants affected with black root may be largely due to the destruction of xylem parenchyma which is of vital importance for plant nutrition, further damaging factors being possibly the plugging of the scalariform perforations by gum, particularly in the hypocotyl, and the physiological effects of phloem and cambium necrosis. The necrotic symptoms of the phloem were traced into the seed coat near the chalaza. No evidence of infection was observed in the embryo, but only very young embryos were examined. It is believed that black root is at least to some extent transmitted by seed, and it is suggested that the transmission may occur by transfusion of the virus from the seed coat to the embryo or take place when the embryo ruptures the vascular system of the seed coat during germination.

Toole (E. H.), Wester (R. E.), & Toole (V. K.). **The effect of fruit rot of Eggplant on seed germination.**—*Proc. Amer. Soc. hort. Sci.*, xxxviii, pp. 496–498, 1 fig., 1941.

In a test made in Maryland to determine the effect of eggplant fruit rot (*Phomopsis vexans*) on seed germination, fruits of the Black Beauty and Fort Myers Market varieties were collected and divided into four groups, showing, respectively, (1) no infection, (2) slight, (3) medium, and (4) severe infection, with 80 to 100 per cent. of the fruit surface covered with lesions, the heavy seeds from each fruit being germinated on blotting paper. The results [which are tabulated] showed that the seeds from the healthy fruits germinated much more rapidly and had a much higher final percentage of germination than the seeds from the infected fruits.

Lambert (E. B.). **Mushroom growing in the United States.**—*Fmrs' Bull. U.S. Dep. Agric.* 1875, 38 pp., 15 figs., 1 diag., 1 graph, 1 map, 1941.

This bulletin, superseding No. 1587 in the same series and *U.S. Dep. Agric. Circ.* 251 [*R.A.M.*, xii, p. 352], contains, in addition to a section on mushroom (*Agaricus* [*Psalliota*] *campestris*) diseases (pp. 28–30), much valuable information, designed to meet the requirements of inexperienced growers, concerning the methods to be employed for the successful production of the crop, the commercial importance of which in the United States has greatly increased of recent years. At present the total annual output, mainly of the white type variously known in the trade as Snow White, White King, and White Queen, amounts to some 35,000,000 lb., grown for the most part in specially constructed houses. Small refrigeration plants, generally based on the washed-air principle and utilizing water pumped from deep wells, enable the period of cultivation to be extended to comprise the late spring and early autumn, while all-the-year-round growth is practicable with the aid of mechanical refrigeration. In the recently introduced 'two-zone' or 'tray' system the prepared compost is placed in movable trays which can be transported into caves or disused warehouses for the growing season.

Details are given of the experimental use of synthetic compost [ibid., xviii, p. 9] prepared by adding suitable mineral nutrients to soaked straw. The most satisfactory compost is stated to be that obtained by wetting 1,000 lb. of straw with two to three times its weight of water, either by sprinkling the straw as turned or by soaking bales of straw in vats, and then adding urea, dried blood, ground limestone, superphosphate, screened soil, and horse manure at the rates of 10, 40, 20, 40, 500, and 100 lb., respectively, and composting in the usual way. The compost so prepared is equivalent to 2 to 3 tons of horse manure and under favourable conditions a yield of $1\frac{1}{2}$ lb. per sq. ft. has been obtained. Over a period of years the synthetic compost has yielded only two-thirds as well as horse manure, but fairly normal yields can be expected when the mixture contains as much as one half horse manure.

During the past ten years the commercial yield of mushrooms has increased from 1 lb. per sq. ft. of bed space to about $1\frac{1}{2}$ lb., some of the factors at least partially responsible for this increase being a realization of the harmful effects of overheating during composting,

the use of fans for air circulation during this process, control of bubbles disease (*Mycogone perniciosa*) through the selection and treatment of the casing soil, regulation of the hydrogen-ion concentration of the casing soil, recognition of the conditions favouring the truffles disease (*Pseudobalsamia microspora*), improvements in fumigation and insect control, and improvement of spawn strains.

Padwick (G. W.). **Mushroom cultivation in India.**—*Indian Fmg*, ii, 7, pp. 363–366, 1 pl., 1941.

Edible fungi popular among the natives in different parts of India include *Morchella esculenta* (Kashmir and Punjab), *Volvaria terastria*, *Lepiota albuminosa*, *L. mastoides*, *Psalliota campestris* (Bengal), and *Podaxon pistillans* (certain districts of the plains), while *V. diplasia* is widely grown for food in Burma [*R.A.M.*, xx, p. 100]. Among the species adapted to large-scale cultivation in India may be mentioned *V. diplasia*, *Panaeolus cyanescens*, and *Coprinus niveus*, while many inquiries have been received concerning the industrial possibilities of *Psalliota campestris*, which are here discussed [cf. preceding abstract] under the headings of varieties and preparation of spawn, bed preparation, cultivation requirements and procedure, importance of temperature, and insect control.

Rives (L.) & Nysterakis (F.). **The cause of resistance to mildew of American Vines and their hybrids. I. Influence of the concentration of cellular fluid. Refractometric measurements. II. Influence of acidity. P_H measurements.**—*Progr. agric. vitic.*, cxxiii, pp. 168–170, 209–211, 1941. [French. Abs. in *Chem. Abstr.*, xxxv, 12, p. 4147; 16, p. 5621, 1941.]

No direct relationship could be established between either the concentration of the cellular fluid or its acidity and specific resistance to [downy] mildew [*Plasmopara viticola*] in American vines and their hybrids [*R.A.M.*, xiii, p. 148]. Acidity being excluded as a determining factor in this connexion, the use of basic spray mixtures should not interfere with the immunity of the vines under observation.

Artigas (C. M.). **Tratamientos contra el mildiu a base de reducir las cantidades ordinarias de sulfato de cobre.** [Anti-mildew treatments on the basis of a reduction in the normal quantities of copper sulphate.]—*Agricultura, Madr.*, x, 109, pp. 162–166, 1 fig., 2 diags., 1941.

Since 1912, experiments have been conducted at the Villafranca del Panadés (Spain) Viticultural Station to determine the possibilities of combining effective control of vine downy mildew (*Peronospora*) [*Plasmopara viticola*] with economy in the use of copper sulphate, which at the present juncture is definitely dictated by the military situation. Among the formulae tested with satisfactory results was that of Menozzi, used in Italy prior to 1915 and consisting of 500 gm. each of copper and iron sulphate, 100 l. water, and sufficient lime to induce a slightly neutral reaction, the cost of which amounted to only 34·07 pesetas for 12 treatments as against 182·60, 179·66, and 108·87 pesetas for Bordeaux mixture, copper acetate, and the 'verdillo' copper compound, respectively. Unless excessively humid conditions supervene, Spanish viticulturists are recommended to give the Italian formula a trial during the present crisis.

JENKINS (W. A.). **Diseases of the Muscadine Grape.** *Ex* **Further studies with the Muscadine Grape.**—*Bull. Ga Exp. Sta.* 217, pp. 19–29, 5 figs., 1941.

The species of *Guignardia* responsible for black rot of muscadine grapes in Georgia is stated to differ in several important respects from *G. bidwellii*, the agent of a disease of the same name on bunch varieties, which is more or less confined to the berries, whereas the muscadine pathogen attacks all the aerial portions of the vine, causing destructive cankers on the current-year canes, the flower clusters, the fruiting pedicels, and the berries, especially of such superior varieties as Hunt, Yuga, and Creek. The cane cankers harbour the fungus during the winter and thus serve as important sources of spring infection. The diseased berries may remain hanging on the vines in a shrivelled, mummified condition, while in other cases they are promptly shed, a condition known as 'shelling'. In seasons when pedicel cankers are numerous, the ground below the affected vines has been strewn with fallen berries, representing a 10 to 50 per cent. loss of marketable fruit. The small, scab-like lesions developing on some older varieties, e.g., Scuppernong, do not materially impair the quality of the fruit. The perfect stage of the organism is produced in the fallen foliage, the ascospores proceeding from which attack the newly formed leaves in the spring. Conidia also develop on old, dying or dead portions of the vines and berries, infected one-year-old canes, and fruiting pedicels.

Mycosphaerella angulata n.sp. (a description of which is expected to appear in a forthcoming number of *Phytopathology*) produces on the leaves chlorotic, later brown to black spots surrounded by haloes and tending to assume an angular shape due to their delimitation by the veins and veinlets. Under humid conditions a grey mycelial efflorescence spreads over the leaf surfaces, the upper being chiefly involved, while in relatively dry weather the under sides bear pustule-like masses of grey, fasciculate conidiophores, on which are produced numerous conidia capable of spreading from leaf to leaf and so contributing to the severity of the disease. Bunch grapes are not susceptible to infection by *M. angulata*, which is also less virulent to the older types of muscadine, Scuppernong, Flowers, and Thomas. Like the *Guignardia* responsible for muscadine black rot, *M. angulata* persists through the winter on fallen leaves and initiates new foliar infections in the spring by means of its ascospores.

An apparently new *Macrophoma* closely related to *M. acniorum* Pass. causes a soft rot of the berries, which in most varieties drop before decay is complete and become mummified on the ground. The fungus has been isolated from overwintered, diseased berries, from old, infected pedicels, and from dying and dead one-year-old canes, and is strongly suspected to be the imperfect stage of a *Physalospora* nearly allied to *P. baccae* [*R.A.M.*, xv, p. 75]. The small, black fruiting bodies are densely strewn over the rotten berries.

At a very early stage of the bitter rot caused by a species of *Melanconium* the berries display extensive areas of fairly large, pulverulent, olive to black pustules, and rapid shrivelling ensues, the old berries being almost entirely filled with stromatic mycelium and thus genuinely mummified, unlike those infected by the *Macrophoma*, in which

dehydration and collapse are followed by gradual desiccation. The *Melanconium* has been isolated from overwintered mummified berries and diseased pedicels, as well as from the bark of dying or dead one-year-old canes. The soft and bitter rot pathogens are believed frequently to gain ingress to the berries through mechanical or insect injuries, and they are known to enter by way of the black rot injury and complete the work of destruction thus initiated.

All the above-mentioned diseases are amenable to control by three applications of 4–5–50 Bordeaux mixture [cf. ibid., xx, p. 338], the first to be given as the young leaves emerge from the buds and do not exceed $\frac{1}{2}$ to $\frac{3}{4}$ in. in size, the second eight to ten days later, preceding rain, and the third after another similar interval. These treatments should be preceded by a dormant spray in early February of 4 lb. copper sulphate per 50 gals. water, and accompanied by stringent vineyard sanitation.

Statutory rules and orders, 1941, No. 1439. Destructive Insect and Pest Acts, England. The Wart Disease of Potatoes Order of 1941. Dated September 12, 1941.—6 pp., 1941.

The Wart Disease of Potatoes Order of 1941, effective as from 15th September, 1941, and applicable to England and Wales only, revises the existing regulations in respect of *Synchytrium endobioticum* [*R.A.M.*, xii, p. 800] as follows. The operation of previous Orders, coupled with the successful results of plant-breeding work during the last 20 years, has greatly reduced the spread of the disease and lessened its economic importance; moreover, some two-thirds of the varieties now in commercial production are immune from infection. Under the new Order, all outbreaks of wart disease must continue to be notified as heretofore, and the planting of non-immune varieties on land that has at any time been infested remains an offence, but it is no longer deemed necessary to schedule large regions of the country as 'infected areas' or to require 'clean land' certificates in respect of all seed potatoes, these being necessary only in the case of stocks planted or sold for planting, in the protected areas surrounding the Wash and comprising certain districts in the administrative counties of Lincoln, the Soke of Peterborough, the Isle of Ely, and Norfolk; in other parts of England, all potatoes planted or sold for planting must either be officially certified as having been inspected while growing and found to satisfy the prescribed standards of purity and health, or carry a licence issued by the Minister of Agriculture. (An explanatory leaflet states that as an emergency war-time measure, a general licence has been issued authorizing the planting and sale for planting, except in the protected areas, of all ware and seed potatoes grown in the British Isles. The Order does not preclude the planting on any land of seed saved from the crop grown thereon in the previous year, unless the latter was infected by *S. endobioticum*, but growers are advised to give preference to seed potatoes officially certified or known to come from satisfactory stocks.)

Service and regulatory announcements January–March, 1941.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, pp. 29–39, 1941.

Particulars are given of the plant quarantine import restrictions in force in the Republic of Brazil, British India, French Zone of Morocco, and the Free City of Danzig.

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